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IMPROVING POULTRY CONDITIONS IN CRETE, CORFU, AND THE PELOPONNESUS

MORLEY A. JULL,
U. S. O. M., Athens, Greece

Having discussed various economic factors pertaining to poultry production in the major portion of the mainland of Greece in the January-March 1957 issue of the World's Poultry Science Journal, I wish to complete the story about Greece by making a few observations on poultry conditions in the islands of Crete and Corfu and in the peninsula of The Peloponnesus.

Crete lies in the southern Mediterranean and the distance from Athens to Heraklion, the largest city in Crete, is about one hour's flight. A few miles from Heraklion is the ancient city of Knossos, the seat of the Minoan civilization, which was the forerunner of European civilization.

The total adult chicken population of the nomos, or agricultural district, of Heraklion in 1956 was about 388,700, of which approximately 295,000 were laying hens. The 1956 egg production amounted to approximately 28 million eggs, or about 95 eggs per hen. Since the human population of the nomos of Heraklion is about 180,000, and since a considerable number of the eggs produced are consumed in other parts of Crete, it is estimated that the consumption per person plus those used for hatching but minus those shipped to Athens was about 75 eggs.

The Director of the agricultural services in the nomos is Mr. Constandinos Drakakis; the extension man is Mr. Dimitrios Giamvzial; and the veterinarian is Mr. Harithimos Kalomirakis, all of whom were very cooperative in acquainting me with poultry conditions in the area. White Leghorns predominate and flock owners are very anxious to learn as much as possible about up-to-date methods of production.

About two miles from Heraklion we had the pleasure of visiting an up-to-date commercial laying plant of some 500 birds operated by Mrs. Eftichia Jonsvounis, a very charming and intelligent operator. A photograph of one of her laying houses is being sent wtih this article along with a photo of a laying house at the Messara Agricultural School, of which Mr. B. Cannellopoulos is Principal.

This school embraces about 350 acres in one of the richest agricultural areas in Crete. The school is entirely self supporting and raises chickens, pigeons, and turkeys. Young girls do

practically all of the poultry work. The school means a great deal to the economic welfare of the community.

In the island of Crete, there are four nomesos, each one of which has an agricultural service, including some poultry extension work.

Visiting Crete impressed upon me the fact that one rarely knows what fate holds in store for him. When Americans in November were evacuated from Egypt on the Chilton, we stopped long enough in Suda Bay, Crete, to be transferred to the General Patch and had a look at the north coast of Crete and here it was about five months later that I returned to Crete.

DIFFERENT STYLES OF LAYING HOUSES IN GREECE

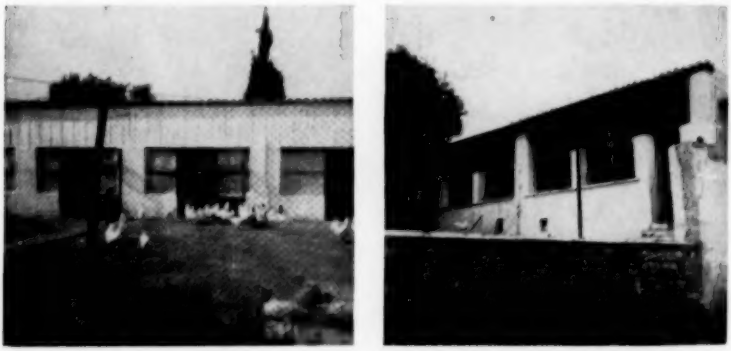
Upper Right: A laying house built entirely of straw in the village of Katsika near Yanina in Northwestern Greece.
Upper left: A laying house made of bamboo and dirt for a small back-yard flock at Rahes in the Peloponnesus
Lower right: These modern-type frame houses with tile roofs provide good ventilation for a laying flock on the island of Corfu
Lower left: This laying house for about 200 White Leghorn layers in the Peloponnesus is stone entirely except for the tile roof

The Island of Corfu is a very picturesque place and has a human population of some 115,700 inhabitants and a laying-hen population of about 120,000. It is evident from the latter figure that there is very little commercial egg production. In 1956 there were about 9,598,000 eggs produced or an average of about 80 eggs per layer. About 20 percent of the total number of eggs produced are shipped to Athens by the egg collecting and grading cooperative located in the City of Corfu.

My reutrn to Athens was by steamer from the city of Corfu to Pireaus, the seaport near Athens. On boarding the steamer at Athens I was quite surprised to find myself on the Princess Alice, the very same steamer on which I had crossed many times between Vancouver and Victoria in British Columbia many years ago when I was carrying on poultry extension work for the British Columbia Department of Agriculture. Greece bought the steamer from Bristish Columbia eight years ago.

The Peloponnesus has always been considered a peninsula by the Greeks because it was always connected with the mainland by a small strip of land until the British dug a channel that separated the Peloponnesus from the Greek mainland except for a bridge over the channel.

The human population of the Peloponnesus in 1956 was 1,239,000. The laying-hen population was about 2,008,400 and there were 172,427,750 eggs produced, of which about 20 percent were shipped to Athens. The average egg production in the Peloponnesus was about 80 eggs per bird.



Left—One of several laying houses belonging to Mrs. Eftichia Jonsvounis, Eraklion, Crete. Right—One of the poultry laying houses at the Messare Agricultural School, Crete. Mr. B. Cannellopoulos in Principal.

EGG PRODUCTION IN 1956 AND CHICKEN NUMBERS IN SPECIFIED COUNTRIES

The upward trend in egg production that has prevailed since World War II continued in 1956 in North America and Western Europe, the world's principal egg-producing areas.

Indications point to expanded output in 1957 by various European countries, primarily the Netherlands and the United Kingdom. Total production for the reporting countries, therefore, should be slightly higher than in 1956. The egg-feed price relationship in Europe is expected to continue quite unfavorable until late 1957.

Total chicken numbers in the major producing countries in 1956 moved upward only slightly from 1955. Numbers expanded in Denmark, the Netherlands, and the United Kingdom but declined in West Germany, Canada, and the United States in 1956 as compared with 1955.

In the first quarter of 1957, United States egg production was slightly larger than in the same months of 1956. Total production of eggs for 1957, however, is likely to fall short of the 65,688 million produced in 1956 because fewer replacement pullets are being raised for production in the fall of 1957 than a year ago. Supplies of mediums will be less plentiful for export during the last half of 1957. Preliminary data indicate the value of United States exports of shell eggs amounted to $3,729,000 in the first quarter of 1957 compared with $4,154,000 during the same period of 1956.

In 1956 the value of United States shell egg exports was $19,246,000, a decrease of 4 percent compared with 1955. Volume was down 10 percent, with 536 million shell eggs being exported. However, the export of egg solids and frozen eggs in 1956 was higher than in 1955. The value of exported eggs and egg products in 1956, therefore, slightly exceeded the value in 1955.

Dutch production in 1956 amounted to about 3,900 million eggs. Approximately 2,376 million were exported; 11 percent more than in 1955. The most important outlet in 1956 continued to be West Germany, which took 75 percent of total exports, followed by France and Italy which received 13 and 9 percent of 1956 exports respectively.

Denmark produced 2,310 million eggs in 1956 and is the world's second largest exporter of shell eggs. During 1956 Denmark exported almost 1,560 million eggs, a decrease of 6.5 percent compared with 1955. West Germany imported 58 percent of Danish exports and remained Denmark's leading

customer. The United Kingdom imported 11 percent, Italy 7 percent and Switzerland 5 percent.

The rapid increase in egg production in the United Kingdom has made that country practically self-sufficient. In fact, the United Kingdom has been exporting shell eggs this spring to several countries. This self-sufficiency has been brought about by the payment of subsidies to producers and has meant that the major exporting countries have had to seek new market outlets. Fortunately for them, West Germany has been increasing its imports about as fast as the British have been decreasing theirs. The result has been the continued absorption of the world's exportable surplus, but at declining prices.

European producers have been suffering from low egg prices during 1957. Consequently, the production of chicks for flock replacement this spring is lower than in 1956 by varying amounts from country to country. The outlook for the

EGGS

Numbers in specified countries, averages 1934-38; annual 1954, 1955, 1956

Continent and Country	Average 1934-38	Average 1946-50	1954	1955	Preliminary 1956
	Millions	*Millions*	*Millions*	*Millions*	*Millions*
NORTH AMERICA:					
Canada	2,863	4,382	4,709	4,599	4,819
Mexico	1,785	1,930	2,400	2,400	2,500
United States	40,020	61,032	64,836	64,836	65,688
EUROPE:					
Austria	663	369	900	990	1,044
Belgium	1,693	1,584	2,325	2,400	2,450
Denmark	1,979	1,447	2,364	2,362	2,310
France	[2]6,200	6,580	7,200	7,300	7,600
Germany, Western	4,810	2,655	6,000	5,945	5,825
Greece	550	388	550	575	600
Ireland	1,086	893	927	873	912
Italy	5,500	4,380	5,860	5,915	6,100
Netherlands	1,978	1,189	3,500	3,720	3,900
Norway	369	283	440	448	448
Sweden	1,000	1,288	1,380	1,424	1,460
Switzerland	423	486	540	546	530
United Kingdom [3] [4]	[5]6,675	6,370	9,156	9,960	11,050
OTHER COUNTRIES:					
Turkey	1,003	859	1,094	1,260	1,300
Japan	3,553	970	6,130	6,743	6,527
Philippine Rep.	[6]738	567	1,050	1,000	1,100
Argentina	1,127	2,760	3,500	3,330	3,350
Brazil	N.A.	3,085	4,639	5.027	5,400
Peru	N.A.	N.A.	400	421	450
Uruguay	289	289	320	325	330
Egypt	751	[7]694	530	535	1,000
Union of So. Africa	[8]360	584	900	950	1,000
Australia	[5]1,848	2,388	2,280	2,400	2,254

[1] Total egg production unless otherwise specified. [2] 1937. [3] Years ending May 31 of year stated. [4] Revised. [5] Three-year average. [6] 1938. [7] 1947. [8] Years ending June 30 of year stated.

fall and winter of 1957-58 is for better egg prices than a year earlier.

In 1956 West Germany, the world's largest importer of eggs, produced 5,825 million eggs. Imports during 1956 reached a record of about 3,500 million eggs—15 percent above 1955. The small market supply of domestic eggs, especially during the summer and fall, and a growing consumer demand led to increased purchases from nearly all traditional European and overseas supplying countries. Major sources were the Netherlands, 51 percent, and Denmark, 26 percent, followed by Poland, Yugoslavia, Sweden and Argentina.

CHICKENS

Numbers in specified countries, averages 1934-38; annual 1954, 1955 and 1956

Continent and Country	Date[1]	Average 1934-38	Average 1946-50	1954	1955	Preliminary 1956
		Thousands	*Thousands*	*Thousands*	*Thousands*	*Thousands*
NORTH AMERICA:						
Canada	Dec. 1	44,077	45,245	39,660	40,159	38,850
Mexico	March	[2] 36,368	38,700	60,000	70,000	72,000
United States	Jan. 1	408,177	465,503	396,776	390,708	382,846
EUROPE:						
Austria	Dec. 3	[3] 8,862	5,640	8,800	8,944	9,250
Belgium	Dec. 31	16,500	14,069	15,000	15,100	15,200
Denmark	July 16	[3] 27,643	22,030	25,013	23,198	24,411
Germany, Western	Dec	[3] 51,124	N.A.	55,366	55,092	52,302
Greece[4]	Nov. 30	11,679	8,366	12,056	12,800	13,300
Ireland	June	15,961	16,677	13,462	13,511	13,527
Netherlands	Dec.	N.A.	7,864	19,778	20,202	21,090
Norway	June 20	5,686	4,617	3,562	3,482	3,935
Sweden	[5]	10,980	12,467	11,777	11,648	11,600
Switzerland	Apr.	[6] 5,544	5,674	6,300	6,240	6,402
United Kingdom —Farm	Dec.	50,000	51,255	59,394	59,997	63,943
Yugoslavia	Jan.	18,000	[7] 17,330	22,000	21,374	22,530
OTHER COUNTRIES						
Turkey		16,764	18,811	21,159	21,400	21,500
Japan	Feb. 1	51,094	17,192	41,805	40,502	40,000
Philippine Republic	Dec. 31	22,790	15,766	39,805	44,584	50,290
Brazil	Dec. 31	N.A.	N.A.	127,000	136,707	146,669
Peru		N.A.	9,388	11,600	12,000	12,500

[1] Year-end estimates (October-December) shown under following year for comparison. Thus, for Canada, the December 1, 1953 estimate is shown under 1954. [2] 1940. [3] Average 2-4 years only. [4] All poultry. [5] September 1937, June 1946-49, April 1950-55. [6] 1936. [7] 1949-50.

Foreign Agriculture Circular, Poultry and Eggs, FPE 5-57, June 17, 1957, U.S. Dept. of Agr., Foreign Agricultural Service, Washington, D.C.

A summary of this information was published in the May 1957 supplemental issue of *Foreign Crops and Markets.*

THE MANAGEMENT AND FEEDING OF POULTRY KEPT ON GRASSLAND*

D. W. EYLES AND S. J. COWLISHAW
The Grassland Research Institute, Hurley, Berkshire, England

The keeping of growing and laying pullets on pasture would be justified if herbage consumption resulted in a lowering of food costs. A saving may be achieved, either by simplifying the mash (by omitting components rich in vitamins, minerals and proteins), or by reducing the total consumption of mash plus grain.

The nutritive value of grazing to poultry was investigated during a seven-year research programme which was started in 1949 at the Grassland Research Station, Stratford-on-Avon, Warwickshire. At the same time studies were made on the persistency of herbage species to poultry grazing, and on the type of sward management required for poultry pastures. The conclusions presented here are based on the results obtained from thirteen field experiments carried out on a heavy lias clay soil.

I. SIMPLIFICATION OF RATION

(a) *Vitamins*

Young green herbage contains an abundance of carotene (Waite and Sastry, 1949). The ultra-violet rays associated with bright sunlight assists the formation of vitamin D from the sterols present in the skin of poultry (Halnan, 1948). Consequently, it was considered likely that vitamin A and D supplements could be omitted from the ration when laying birds were given summer grazing.

In Experiment I Brown Leghorn x Light Sussex point-of-lay pullets were allocated to two treatments:—

(1) folded on concrete (no access to herbage)
(2) folded on pasture

All the birds were fed the same amount of a ration which was complete except that cod-liver oil was omitted during the summer. The same type of fold was used for both treatments, so that all birds had equal exposure to sunlight.

The egg production (Figure I) and body weights of the birds on concrete fell when cod liver oil was not included in the ration. The carotene supplied by the yellow maize in the grain mixture was insufficient to support high egg pro-

* Presented at the meeting of the United Kingdom Branch, The World's Poultry Science Association held in London, England, March 29, 1957.

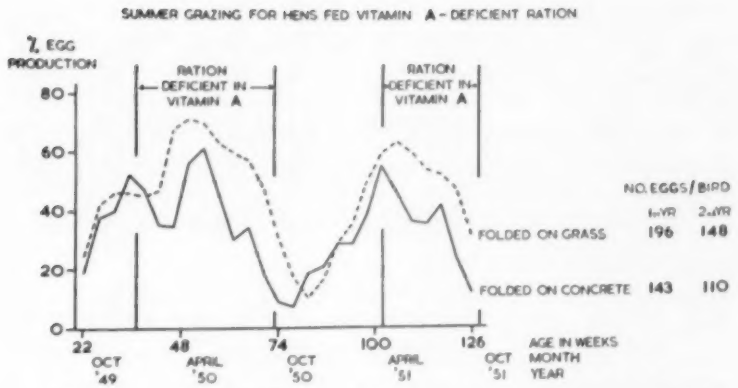


Fig. 1. Egg production from hens fed a vitamin A-deficient ration during the summer grazing season (Experiment 1.)

duction. In contrast the birds folded on pasture continued to lay well and maintained their body weights when cod liver oil was omitted from the ration. These birds must have obtained appreciable quantities of carotene from herbage.

(b) *Minerals*

The value of grazing as the major supplement to an all-cereal ration for laying hens was investigated in Experiment 2.

Rhode Island Red x Light Sussex laying pullets were allocated to four treatments:—

(1) Normal diet; folded on concrete
(2) Normal diet; folded on pasture
(3) All-cereal ration; folded on concrete
(4) All cereal ration; folded on pasture

Limestone and flint grit was available without stint; thus the hens could satisfy their high calcium requirements for egg production.

Irrespective of whether grazing was available or not there was a rapid decline in egg production, egg size and body weight of *all* birds fed on the all-cereal ration, while *all* birds fed on a normal diet maintained their egg production, egg size and body weight. After only seven weeks on the all-cereal ration, most of the birds had stopped laying and were moulting, but when changed onto the normal diet they quickly recovered. When 0.3% of a mineral mixture (4 pts. steamed bone flour plus 1 pt. common salt) was added to the all-cereal ration being fed to the birds folded on pasture, egg production increased, but it never reached the level attained by the birds fed the normal ration and folded on pasture.

It was concluded that laying hens were unable to obtain their requirements for calcium, phosphorus and common salt from pasture (see also Robertson *et al.*, 1930).

(c) *Proteins*

A third experiment measured the value of grazing as a supplement to a ration composed mainly of cereals plus minerals.

Eight-week old Rhode Island Red pullets were allocated to two treatments:—

(1) normal diet (16% crude protein)

(2) 'mainly wheat' diet plus 0.5 oz. per bird per day of mash fortified with 5% mineral supplement (13% crude protein)

The normal diet consisted of 1 oz. wheat plus 1.5 oz. proprietary mash at 8 weeks of age, rising gradually to 2 oz. wheat plus 3 oz. mash per bird per day for adult birds. Throughout the experiment only 0.5 oz. of the mineral-rich mash was fed in the 'mainly wheat' treatment, and wheat feeding was gradually increased from 2 oz. at 8 weeks of age to 4.5 oz. for adults. Birds in both treatments were folded on pasture.

At 24 weeks of age there was no significant difference between the body weights of birds on the two treatments, but birds fed the normal diet came into lay two weeks before those fed the 'mainly wheat' diet. The latter birds gave significantly ($P<0.5$) fewer eggs during the first laying year than birds fed the normal diet (Figure 2).

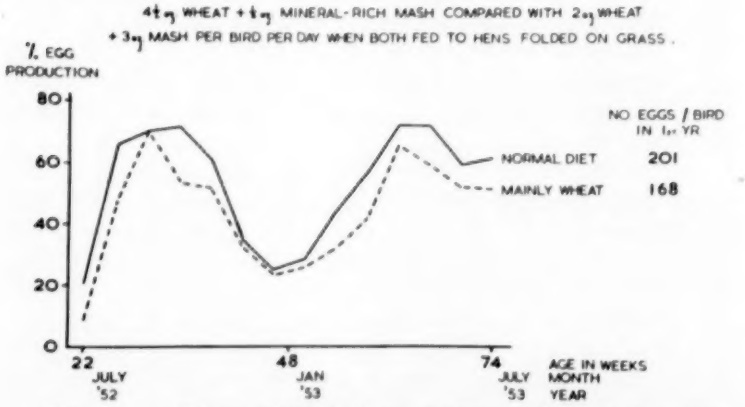


Fig. 2. 4½ oz. wheat +½ oz. mineral—rich mash compared with 2 oz. wheat + 3 oz. proprietary mash per bird per day when both fed to hens folded on grass (Experiment 2).

Probably the mainly wheat diet was adequate for growth because these pullets were at the grower stage (8-24 wks.) during spring, when herbage is most valuable provided it is eaten when young. However, laying birds fed the mainly wheat diet failed to obtain all the extra protein they required (14.0% C.P. is minimum level for high egg production according to Carpenter, Duckworth and Ellinger, 1954) from the herbage available inside the limited area of a fold.

II. SAVING MASH

Preliminary work suggested that more mash was saved when birds could graze selectively at free range than when choice was restricted by folding. Also any arbitrary reduction in the amount of mash offered (without a compensating increase in the quantity of grain) usually resulted in a lower egg production.

In Experiment 4 eight-week old Rhode Island Red pullets were allocated to three treatments:—

(1) Concrete run; mash hoppers open from 7.30 a.m. to 1.0 p.m.

(2) Free-range grazing; mash hoppers open from 10.30 a.m. to 1.0 p.m.

(3) Folded on pasture; hand-fed normal amount of mash each morning.

All birds were fed the same amount of wheat in the afternoon.

From 8 to 20 weeks of age the mean daily consumption of mash was 1.9 oz. per bird for those on concrete, 1.8 oz. for those at free-range, and 2.0 oz. for those in folds; in addition 1.2 oz. wheat per bird was eaten under all treatments. At 20 weeks of age, there was no significant difference between the body weights or age at sexual maturity of birds on concrete and those at free range, but both were significantly ($P<0.2$) lighter than the birds in folds.

From 20 to 116 weeks of age the mean daily mash consumption per bird was:—2.3 oz.—concrete; 2.0 oz.—free-range; 3.0 oz.—folds; in addition 2.0 oz. wheat per bird per day was eaten in all treatments. Birds at free-range produced a similar number of eggs to those in folds although the latter had higher body weights. Egg production from the birds on concrete was significantly ($P<0.2$) lower than that from either the birds at free range (Figure 3), or in folds.

It was concluded that pullets at free range could be encouraged to graze by closing the self-feed hoppers. The in-

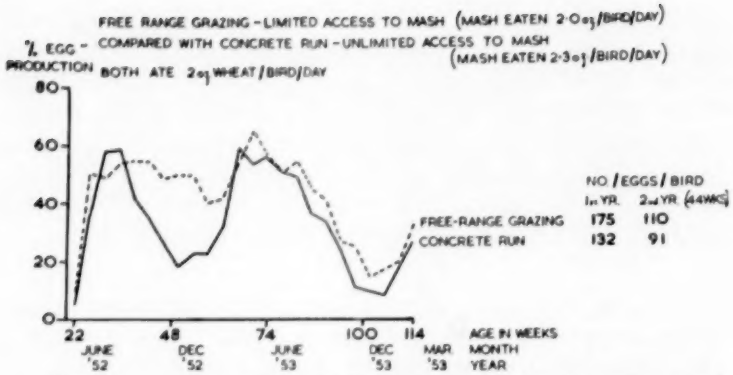

FREE RANGE GRAZING - LIMITED ACCESS TO MASH (MASH EATEN 2·0 oz/BIRD/DAY)
% EGG PRODUCTION - COMPARED WITH CONCRETE RUN - UNLIMITED ACCESS TO MASH (MASH EATEN 2·3 oz/BIRD/DAY)
BOTH ATE 2 oz WHEAT/BIRD/DAY
80
60
40
20
0
NO/EGGS/BIRD
1st YR. 2nd YR. (44 WKS)
FREE-RANGE GRAZING 175 110
CONCRETE RUN 132 91
22 48 74 100 114 AGE IN WEEKS
JUNE '52 DEC '52 JUNE '53 DEC '53 MAR '53 MONTH
YEAR

Fig. 3. Free range grazing—limited access to mash (mash eaten 2.0 oz. per bird per day) compared with concrete run—unlimited access to mash (mash eaten 2.3 oz. per per bird per day). Both ate 2 oz. wheat per bird per day. (Experiment 4).

gested herbage partially replaced mash without detrimental effects on optimum growth or egg production.

III. PERSISTENCY AND MANAGEMENT OF POULTRY PASTURES

(a) *Persistency of herbage plants.*

At normal poultry stocking rates the flush of herbage growth in spring cannot be utilized by the birds alone. Excess growth has to be mown, or grazed by sheep, to keep the herbage short, young and suitable for poultry grazing. Hence herbage species were tested for persistency to poultry grazing combined with a sward management to control excess growth.

Swards established from simple seed mixtures of one herbage strain plus white clover were folded with poultry (120 birds per acre) and frequently gangmown during the first, second and third harvest years in Experiment 5. Folds were moved daily returning to the same area every 3 months.

The prostrate pasture strains of grasses (e.g. S.23 perennial ryegrass, S.50 timothy) were more persistent (Table I), produced a closer turf, and were easier to keep short than the erect hay strains (e.g. Scotch timothy). All the cocksfoot strains, even S.143, produced open swards and were not persistent. S.50 was the most palatable grass strain. Yarrow was persistent and palatable; its underground root stock enabled quick recovery after defoliation. S.184 white clover was killed because it was extremely palatable, its stolons were damaged by poultry scratching, and the nitrogen-rich poultry manure encouraged the grasses which crowded out the clover.

TABLE I

Persistency of herbage strains subjected to poultry folding plus gangmowing (Experiment 5)

Strain (sown with white clover)	% of strain at start	% of strain after 3 years
S.23 perennial ryegrass	88	77
Yarrow	78	51
S.50 timothy	90	50
S.143 cocksfoot	71	18
Scotch timothy	66	10
S.184 white clover (sown alone)	63	9

In Experiment 6 (Cowlishaw, Eyles and Astbury, 1956) swards of S.50/yarrow/S.184 and S. 23/S.184 were grazed during the first and second harvest years by poultry at free range (300 birds per acre in 1953-4; 200 in 1954-5) and by sheep (550 grazing-days per acre in 1953; 1,100 in 1954).

A poultry flock rotationally grazed three plots of each sward, spending 4 weeks on each plot.

Although both swards were completely defoliated during the wet winter of 1953-4, S.23, S.50 and yarrow recovered when the swards were rested in March, April and May 1954. Damage was not so severe during the dry winter of 1954-5, and at the end of the experiment the swards were dominantly S.23 and S.50/yarrow respectively (Table 2). S.184 white clover was almost completely eradicated by the selective grazing of both poultry and sheep.

It was concluded that S. 23 was very persistent under poultry grazing. S.50/yarrow was fairly persistent and was also palatable.

TABLE II

Persistency of two seeds mixtures subjected to free-range poultry plus sheep grazing (Experiment 6)

NO.	Seed mixture	% of sown species at start	% of sown species after 2 years
1	S.23 perennial ryegrass S.184 white clover	75 25	70 0
2	S.50 timothy + yarrow S.184 white clover	48 52	63 4

(b) *Management of poultry pastures*

Probably poultry ingest more herbage of higher feeding value when grazing white clover than when grazing grasses, because white clover has a lower fibre content than grasses. Hence one aim of the management of poultry pastures should be to encourage white clover.

During the two years of Experiment 7 swards established from three simple seeds mixtures (S.23, S.50, and S.143 each sown with white clover) and one complex mixture (Cockle Park type) were subjected to four treatments:—

(1) frequent gangmowing (10 times per year)
(2) frequent gangmowing + poultry folding
(3) frequent grazing (1,200 grazing-days per acre per year)
(4) sheep grazing + poultry folding

Sward managements were imposed only during the season of pasture growth, while poultry folding (70 birds per acre) continued during winter as well as summer. Folds were moved daily, returning to the same area every 4 months.

In all four swards gangmowing alone encouraged white clover, while sheep grazing alone discouraged it (Table 3).

TABLE III

Effect of sward management on persistency of white clover (Experiment 7)

Sward management	% of white clover		
	at start	after 2 years of	
		management alone	management + poultry folding
gangmowing	16	30	17
sheep grazing	16	10	7

Irrespective of sward management, poultry folding depressed the white clover content. This depressing effect was counteracted by gangmowing, so that under treatment 2 the contribution of white clover was maintained.

It was concluded that gangmowing minimised the reduction of white clover caused by poultry folding.

The conclusions drawn from these poultry grazing experiments are supported by those reached after reviewing the relevant literature (Eyles, 1957; Cowlishaw and Eyles, 1957).

ACKNOWLEDGMENTS

Thanks are due to Dr. William Davies for originally suggesting this research and for advice; to Mr. G. Pearson Hughes for help; and to many others for field assistance.

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UNIQUE GREEK METHOD OF INCUBATION

While visiting poultry breeding plants, commercial laying flocks, and hatcheries in Greece, I came upon an interesting situation in a hatchery operated by Mr. I. Katsoulis. In the incubation room there was a large incubator in the front of the room and another large incubator at the back of the room. The two incubators were separated by a space of about 12 feet. In this space Mr. Katsoulis had placed a metal rack about four feet long and about two feet wide, with a wire-mesh screen stretched from end to end and side to side. A considerable number of eggs were lying on the screen.

Mr. Katsoulis said that he usually got slightly better hatches from the eggs on this tray than from the eggs in his regular incubators. The room temperature was maintained at 98°F and the relative humidity of the atmosphere in the room was maintained at about 60 per cent. The cost of the automatic device for controlling the room temperature and the per cent relative humidity of the air in the room was excessive but Mr. Katsoulis was confident that by greatly increasing the number of eggs hatched on trays, the cost of incubation would be relatively less than with "incubator" eggs.

(Morley A. Jull, U. S. O. M., American Embassy, Athens, Greece)

SOME PRELIMINARY INVESTIGATIONS INTO THE EFFECTS OF LIGHT ON BROILERS*

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I am not a scientist, but a practical broiler producer, rearing 100,000 birds a year on my farm. The experiments conducted by us during the last three years are still incomplete, and while I can quote certain factual advantages to be derived from what is now called the "Peak" system of broiler production, there are still a number of advantages whose precise value we have not yet ascertained.

We started with two basic premises.

1. That crumb or pellet feeding promoted speedier growth than mash feeding, improved feed conversions, and, despite the additional pelleting charge of 7/6 to 10/-per ton, increased profitability.
2. That de-beaking was expensive in labour, upset the birds unless performed at day-old (when it required a degree of skill not easily found if damaged chicks were not to result from it), and had little or no effect on feed conversion, though it did eliminate feather-picking and cannibalism.

Our experiments, all of which concern the lighting of broilers, fall into three categories:

1. Light colour.
2. Light intensity.
3. Light periods.

Light Colour

We early discovered that light colour had a surprising effect on broilers. Sunlight, or white electric light, excited them to such an extent that with certain strains, it was almost impossible to feed the birds without causing a stampede, while every breed of bird—and there have been many—wasted valuable feed in unnecessary fighting, running about, and "provocative visiting". Cannibalism and feather-pecking were rife.

When, however, these same birds were subjected to a red light, created initially by painting the windows red, then by the use of red electric light bulbs, and latterly by the use of red fluorescent instant-start strip lighting, they immediately became much more docile, fighting and visiting de-

* Presented at the meeting of the United Kingdom Branch of the World's Poultry Science Association, London, England, March 19, 1957.

creased, and cannibalism and feather-pecking were completely eliminated, even on such slow-feathering crosses as RIR/LS.

Why? I fancy because the colour red, which seems to have an amazing fascination for chickens, is eliminated to the extent that a bright red plastic hanging feeder appears milky pink, fresh blood appears translucent and dried blood appears black, resembling black markings in the plumage. Whether this invalidates the theory that feather-plucking is due in part at least to some nutritional deficency I am not qualified to say.

We found, too, that when we suspended squares of coloured perspex, ranging from red through orange and white to blue, over a 13 ft. feedingtrough, the red food was eaten first, the white second, the blue last, and then only reluctantly. These findings were repeated several times. In the same way, a red hanging feeder suspended among galvanised feeders in a normally daylight-lit pen was emptied in preference to any other.

Experimenting further, we found that in blue light broilers were virtually blind. Where previously we had to use catching-screens, we now extinguish all lights except a few dim blue lights per pen, and can walk in and pick up the birds without the aid of catching-screens, thereby eliminating broken limbs, bruising and piling—and overtime pay for night bird clearance.

Light Intensity

In determining the minimum amount of red light required to eliminate feather-plucking and cannibalism, without impairing feed intake and therefore rate of growth, we worked backwards from yellow through orange to red light. With orange and yellow light we got feather-plucking in three hours and half an hour respectively. The *exact* point at which red light allows feather-plucking, and the exact point at which it causes a drop in feed intake, has yet to be determined. At present I can say only that we have never yet been able to provide sufficient intensity of red-light to allow feather-plucking—which leads one to wonder whether the colour rather than the intensity of light is not the overriding factor. We seem to detect a slight drop in feed intake if less than 5 ft. 80 watt red fluorescent light, suspended eight feet from the floor, is allowed per 720 square feet of floor space. As yet, however, we don't know the exact intensity of red light at which the disadvantages begin to outweigh the advantages.

In using blue lights for catching, two 25-watt blue-painted electric light bulbs per 1500 sq. ft. of floor space seems to represent the optimum. In such a dim light it is possible to walk in and pick up the birds where they lie, without causing any tendency to creep and pile.

Light Periods

As long ago as 1943 and 1951 papers appeared in "Poultry Science" regarding the influence of intermittent periods of light on the growth rate of chicks. It was found that chicks submitted to alternate two-hour periods of light and dark made greater growth than chicks enjoying the normal 12 hour periods of light and dark.

To date we have experimented with one hour feeding and four hours resting up to 18 days, thereafter alternate four hours or two hour periods of light and dark.

With what results?

Using surplus heavies (60% cockerels, 40% pullets) run at 0.74 sq. ft. per bird, we averaged on a 8,043 bird batch a live-weight at 3.78 lb. at 73.12 days (10 weeks 3 days) for a feed conversion of 3.04:1, giving a performance efficiency of 124, or a point spread of .74.

Using White Rock/Light Sussex (400) as-hatched experimental numbers only, we averaged 4.17 lb. liveweight at 77.3 days (11 weeks) for a feed conversion of 3.05:1, giving a performance efficiency of 138, on a point spread of 1.12.

Using Broiler Hybrids as hatched (400), experimental numbers only, we averaged 3.38 lb. liveweight at 67.8 days (9 weeks 5 days) for a feed conversion of 2.68:1, giving a performance efficiency of 126, or a point spread of .70.

We are satisfied that the use of light plays an enormous part in the profitable production of broilers. We do not yet know how best to use that light, particularly as regards lighting periods.

Carrying out these experiments, we have evolved a windowless type of house, in which ventilation is entirely fan-controlled, and in which birds run at 0.75 sq. ft. per bird winter and summer, as against the normal 1 square foot per bird, do as well as, or better than, identical birds in the conventional type of house, and return additional 25% profit per square foot of floor space—which surely better represents the return per £ of capital invested than any other profit figure per bird, per lb. liveweight or per flock.

OBSERVATIONS ON OOCYST COUNTS OF DEEP LITTER RELATIVE TO COCCIDIOSIS*

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I have often wondered how much reliance can be placed on oocyst counts taken from litter. It seemed to me that there might be wide variations in different parts of a house or pen and I wondered if there was a constant high count at places where chicks or adults congregated the most i.e. under the lamps, round the food troughs or the water supply. When, therefore, a death from acute caecal coccidiosis occurred amongst a small group of experimental broilers in a pen 6 feet square, this seemed to be an ideal opportunity to commence observations on the subject.

Litter counts were taken daily from the same places, using an identical routine each day, for six days. The method for oocyst counting was that recommended by Dr. C. Horton-Smith. Briefly, this consists of immersing 30 grammes of litter in 420 ccs. of water overnight. The mixture is then filtered through a sieve (with a mesh of 85 to the inch) into a white enamel bowl. From the enamel bowl a centrifuge tube is filled with some of the filtrate and this is centrifuged at 1500 r.p.m. for 10 minutes. The supernatant fluid is then poured off and replaced with saturated salt solution. After a thorough shaking the counting chambers of the McMaster slide are filled. Having allowed time for the oocysts to float to the top of the salt solution, the count is made.

In Table I can be seen the variation in the counts which occurred in this pen. These counts are the number of oocysts/gm. of litter.

The sample from the food troughs was taken by picking up small portions of litter from three different places on either side of the trough; the 'water' sample by picking up litter from the board in front of the single trough; the lamp sample from directly under the centre of the infra-red ray lamps, and the average sample from these three places and three other places in the pen.

The first thing that strikes one is the wide variations in counts in various parts of the pen on a particular day; also, the wide variation in the same part of the pen on different

* Presented at the meeting of the United Kingdom Branch of the World's Poultry Science Association, held in London, England, March 29, 1957.

TABLE I

Site	*Fri.*	*Sat.*	*Mon.*	*Tues.*	*Wed.*	*Thurs.*
Food trough	10,000	3,700	2,000	3,550	7,500	500
Waterer	1,600	3,400	700	300	3,250	200
I.R.R. Lamp	2,000	1,400	500	6,750	3,850	500
"Average"	200	800	550	7,500	650	400

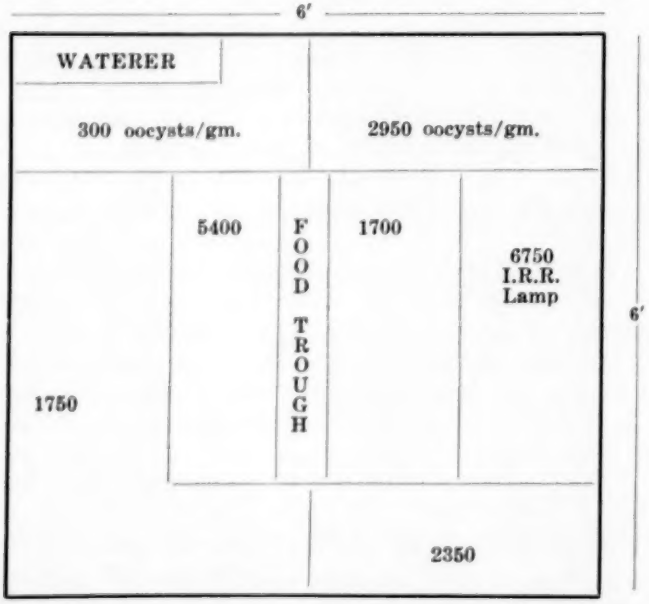
days. These variations appear to be conspicuous by their inconsistency.

On another day samples were taken from seven different parts of the pen and an average made up from these seven, the results being given in Table II.

The outstanding features here are the low counts by the water trough and on the right side of the food trough between the two respective high counts on the left hand side of the trough and under the lamp. These counts tend to suggest that the chicks eat from the left hand side of the trough in preference to the right but practical observations proved this possible inference to be false.

This variation in oocyst counts was also noted in samples

TABLE II



taken from a deep litter poultry house. Near the door the count was 600 oocysts/gm., in the middle of the house the count was 1,200 oocysts/gm. and by the drinker the count was 3,500 oocysts/gm. An average sample, prepared by mixing equal parts of the three, was 1,100 oocysts/gm. Fourteen days later samples were taken from 9 different places in the same deep litter house. In 5 spots the bulk samples were negative, whilst in the other 4 places the counts were 1,000 oocysts/gm.

In another pen in which birds were losing condition, I thought that possibly there might be a high oocyst count. I also wished to confirm that a higher count would occur in the damp, caked, warm litter round the food trough and waterer as opposed to the dry, crumbly litter in front of the nest boxes. As before, an average sample was taken to see how representative it proved to be. The result was a count of 27,000 by the food trough, 11,700 by the water trough, and 1,800 in front of the nest boxes. The average sample was 10,000 oocysts per gram.

I am not attempting to explain how or why this variation occurs—I only wish to illustrate that it does occur and that it may be best not to place too much reliance on litter counts. The detailed variation quoted has only occurred in a pen six foot square. One can easily imagine the variations and differences which could occur in a large deep litter house. Another point is that in carrying out these counts certain laboratories use a method in which only 3 gms. of litter are taken for dilution in 42 ccs. of water as compared with 30 gms. in 420 ccs. The using of a much lesser quantity of litter could also be responsible for an increase in the already apparent variation.

Thirdly, these counts do not take into account whether or not the oocysts are pathogenic or even whether they are pathogenic species of coccidia.

So, in conclusion, I suggest that it would appear that in order to get the most value from a litter count, one should send really bulk samples of litter taken from several different parts of a house rather than an average sample made up of bits of litter bulked up from several different parts of a pen or house.

Finally, though a count of—say 5,000 oocysts/gm. may be significant—a lower count should not necessarily be taken as an indication of freedom from infection.

RECENT ADVANCES IN POULTRY PRODUCTION*

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Rome, 13 March 1957.

Is it not surprising that eggs and poultry meat are cheaper nowadays and of better quality than they were four or five years ago? This progress, to the benefit of the consumers, is the result of intensive work in research, education and extension in many countries. While time does not permit a detailed appraisal here of the recent advances in the poultry industry, I would, however, draw attention to a few highlights (and to show you some color slides I took in various parts of the world).

First of all it should be kept in mind that poultry, and particularly chickens can be multiplied very quickly, provided you have the necessary knowhow. Furthermore, poultry is able to stand even unfavorable climatic conditions, existing in hot or cold countries and in high altitudes. Acclimatization is always a problem, of course, but far easier to solve with poultry than with other livestock.

Eggs and poultry meat are foods of high biological value. The eggs are protected by their shells against adulteration and quick deterioration. Furthermore, poultry provides fresh meat in small portions and not much capital is required to keep some utility birds.

Systematic promotion of poultry production was started near the end of the last century, particularly in the U.S.A., but also in some European countries. Much pioneer work was done before the second world war, but far more progress has been achieved since then, and it is characteristic for the recent development that the World's Poultry Science Association (WPSA) which was established in 1912, could double the number of its members within the last few years and form strong Branches in Australia, Germany, Japan, The Netherlands, South Africa, Sweden, Switzerland and the United Kingdom. More Branches will certainly be established in due course.

The *veterinary research workers* discovered and introduced efficient and safe vaccines and many new drugs. The vaccine against Newcastle disease, the sulpha drugs and the antibiotics are three striking examples which helped to reduce

* Talk given at the Meeting of the Agriculture Division of FAO,

mortality among poultry from a disastrous level to a minimum, even in cases where thousands of birds are being kept together in one room.

A second group of research workers who did an excellent job particularly during the last ten years were the geneticists. Terms like "population genetics" and "progeny testing" have become more and more widely understood. There are many poultry breeders today who maintain several hundred small breeding pens and trapnest up to 10,000 birds. Many breeding programs have been placed under the control of geneticists with the result that more resistant and faster-growing birds are being produced.

In many commercial poultry farms the pure breeds are on the way out. Crosses of strains and breeds which "nick" with one another are becoming more and more important. Hybrid vigor, or heterosis is also utilized in the form of double crosses of four inbred lines, both for meat and egg production. The so-called "High-Lines", introduced by Henry Wallace, are a typical example. On the whole, the results from "Hy-Lines" are good, but less striking than, for example, those obtained with hybrid corn.

During the last ten years the introduction of modern breeding methods, combined with improved feeding and better management, resulted for example, in the U.S.A., in an increase of 33 eggs per hen per year. In 1945 average production in Record of Performance Farms was 186; in 1955 it was 219 eggs per year. Similar progress, through partly on a lower level and to a smaller extent, has been made e.g. in Canada, Denmark, Finland, France, England, Holland, Ireland, Israel, Japan, the Philippines, Thailand, Australia, South Africa and—to come back to Europe—in Sweden and Switzerland. In the latter country a so-called "Genetics Ring" (GE-RI) was established in 1951. About ten professional poultry farmers work together and are in close contact with a geneticist from the Berkeley University in California.

The United Kingdom was an egg importing country for many years. Now she is producing 100 percent of the eggs consumed in the country. This year the United Kingdom even started subsidized exports of eggs to France and Western Germany. This has provoked strong protests from the Danish and the Dutch Governments which represent traditional export countries. However, egg production is still very low in

many other countries and frequently below 70 small eggs per hen per year. In this connection, it is encouraging to know that there is a growing interest for the poultry industry in Latin-American countries, in India, in Arabic countries as well as in Russia and her neighbours.

Research in disease control, genetics and nutrition also gave a considerable impetus to the broiler or table-chicken industry, particularly in U.S.A., the United Kingdom and, last but not least, in Italy and Germany. Some of you may have seen the new "Cittá dei Polli" near Aprilia (not far from Rome) with a capacity of about 800,000 birds. In Western Germany a broiler plant is under construction with an annual capacity of about 1.5 million birds. There, one man is expected to look after 50,000 birds.

The United States total production of broilers amounted to 293 million birds in 1946. It reached 1250 million in 1956. The most remarkable example of efficiency in poultry production has recently been obtained by the Poultry Department of the University of Maryland. Three-pound birds were produced at eight weeks of age. In the past it took 14 to 16 weeks to get such birds. In the Maryland experiment only 1.96 pounds of feed, which contained 12% fat, were needed per pound of broiler. The old conversion rate was three to four pounds of feed per pound of live weight gain.

According to Professor Morley A. Jull, USOM Poultry Adviser, officials from the U.S. Department of Agriculture have calculated that in 1955 a man had to work:

53 hours to produce $100 worth of milk
18 hours to produce $100 worth of hogs, and only
13 hours to produce $100 worth of broilers.

Chickens now provide the cheapest meat in the United States of America. With one hour's work a labourer can buy a broiler which means four or five portions of excellent meat.

In the United Kingdom a very active broiler association has recently been established. The target aimed at the last meeting was an annual throughput of 100 million broilers by 1960, nearly ten times the present figure. (Incidentally, the British do not like the word broiler. In putting out publicity to boost sales, words like "spring chicken" or "tendachick" were recommended.)

Improved poultry breeding methods have provided more efficient generations of birds. Better poultry needs *better feed*, of course, and here again, research workers made considerable progress during the last few years.

The present day poultry rations, particularly those in the U.S.A., differ from the pre-war mashes in that several of the newer diets contain more calories. Many modern poultry rations obtain their protein primarily from cheap vegetable sources and contain small quantities of various new ingredients. Some of them are nutrients like fats, and essential amino-acids, mainly methionine and lysine, or vitamins like A, D_3 and the B complex, particularly B_{12} which is extracted from the mould which produces streptomycin. Vitamin B_{12} added to an all-vegetable protein ration provides a balanced feed at lower cost than those containing animal proteins, which are relatively scarce and expensive in many countries. Recent research work revealed that there were other unidentified factors important in poultry nutrition, for example the "whey factor" the "fish factor" and the "alfalfa factor". Other growth factors will probably be isolated and synthetic sources discovered in due course. Many modern poultry mashes include also new non-nutrients, like minor elements, (maganese sulfate is one of them) and arsenicals as tonics, and/or antibiotics and drugs, in order to keep the so-called "stress factors" down. Furthermore, anti-oxidants are sometimes added to poultry mashes. They reduce the loss of fat-soluble vitamins and retard the rancidity of added fats. Some broiler rations contain synthetic female sex hormones, for example dinesterol-diacetate which reduces male characteristics and increases fat deposition. On the other hand there is little evidence to support the idea that the so-called surfactants which have tended to replace soap in the household, will stimulate growth if added to the diet.

In this connection it may be mentioned that research work in the field of *atomic energy* has also its place in poultry nutrition. Tracer studies at Beltsville have shown that sulfate sulfur is of definite value to chickens. Sulfate can partly replace the essential amino-acids, methionine and lysine in diets.

Many other items could be mentioned where considerable progress has been achieved during the last few years. For example chick-sexing with machines, artificial insemination of turkeys and chickens, housing and equipment such as incubators, laying batteries, and automatic feeders, management methods and processing of poultry. In the United States "acronized" chickens are now on the market. To "acronize" is the process which employs the antibiotic aureomycin to stop bacterial action in slaughtered birds for several days. The process is considered to be entirely harmless to the consumer

and it has been approved by the Food and Drug Administration of the United States of America.

In concluding this short survey on recent advances in the poultry industry, I wish to stress the following points:

1. There is no doubt that poultry husbandry offers great possibilities as a source of additional income and better human nutrition in practically all countries of the world.
2. The methods of promotion of the poultry industry which is still badly neglected in many countries ought to be carefully adapted to the conditions which prevail in each country.
3. Distribution of chicks without efficient control of poultry diseases and adequate supply of feedstuffs can be devastating.
4. Education and training of research workers, extension people and ordinary poultrymen should go hand in hand with the establishment of breeding centres.
5. Furthermore, egg and poultry meat production should be developed in accordance with the marketing possibilities.
6. It is obvious that poultry production is a typical example where international cooperation is a necessity and where FAO can also make its contribution, both through its regular program of work*) and the technical assistance program.**)
7. Finally, as far as possible, the already existing cooperation with other governmental organizations such as the Colombo Plan and the United States Operations Mission as well as with the non-governmental World's Poultry Science Association should be strengthened.

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* Problems relating to poultry production were discussed at several FAO meetings on animal production, animal feeding and animal health in different regions including Latin America. The first special meeting on poultry production was held at Poona, India from 17-27 October 1955. A similar meeting is planned for the Near East region and will take place in Cairo from 8-12 December 1957.

** Experts for technical assistance in poultry production were provided by FAO to the following countries: Burma, Cambodia (1957), Ceylon, Cyprus, Egypt, Haiti, India (1957), Iran (1957), Iraq, Israel, Mexico (1957), Pakistan, Thailand and Yugoslavia.

TECHNICAL MEETING ON POULTRY PRODUCTION IN THE NEAR EAST AND NORTH AFRICA

The lack of protein and other protective components in the human diet is still a serious problem in many countries, particularly among people with low incomes. In many cases, and especially in countries where pork is not eaten, chickens and other poultry could help to meet the gap, because they are able to convert into eggs and meat feeding stuffs which may not be suitable for human consumption or inaccessible to farm animals. The increasing popularity of these products is mainly

justified by their content of essential nutrients, particularly proteins and vitamins.

Not much capital is required to keep some utility birds and they are able to stand even unfavorable climatic conditions. Hence, poultry is to be found nearly everywhere in the world.

In several countries poultry production has become a very important and highly specialised industry, thus making a remarkable contribution to the national income. However, there exist still wide areas, suitable for a considerable extension of egg and poultry meat production, where most of the birds are kept in a low producing and uneconomical way, which means a loss of individual and national income and a lower level of human nutrition.

Provided diseases can be kept under control and sufficient feeding stuffs, not required or not suitable for human consumption are available, poultry and particularly chickens can be multiplied rapidly. However, development of an efficient poultry industry in any particular country or region requires careful consideration of all the many aspects involved. Experience has shown that international cooperation in order to pool knowledge, ideas and efforts can stimulate and facilitate appropriate action. Accordingly, the Food and Agriculture Organization of the United Nations will organise a Technical Meeting on Poultry Production for the Near East and North Africa, similar to that which was held at Poona (India) for Asia and the Far East in 1955.

The Meeting on Poultry Production for the Near East and North Africa, for which the Government of Egypt has kindly consented to act as host, will take place in Cairo from 8 to 12 December 1957. It is hoped that invited governments will nominate competent delegations to attend the meeting and coperate in order to make it a success.

The governments of Afghanistan, Egypt, Ethiopia, France (for Algeria), Jordan, Iran, Iraq, Lebanon, Libya, Morocco, Pakistan, Saudi Arabia, Sudan, Syria, Tunisia, Turkey, United Kingdom (for Cyprus) and Yemon are being invited to send representatives to this meeting, which will provide an opportunity for discussions on the present status and importance of the poultry industry in the various countries of the region, and the possibilities for improvement.

CO-RELATION OF FERTILITY TO CONFORMATION IN B.B.B. TURKEY COCKS*

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The greatest problem facing turkey breeders today is fertility. Broad breasts are essential in modern turkeys. Unfortunately it has been the experience of most turkey breeders that the broader the breast, the lower the fertility.

This was the problem that faced my collaborators and myself several years ago. We felt then, and personally I have not changed my mind, that artificial insemination was no solution. I do not consider it in any way desirable to perpetuate a race of birds unable to reproduce themselves entirely naturally. I have sought another way to solve the problem. I am not going to say that it has been solved. But in the last few years I have managed to collect quite a lot of data concerning the individual performance of a considerable number of birds, males and females.

Careful and detailed observation of behavior has indicated that only in a very few cases is infertility due to the females. Of some hundreds of hens observed on different farms, some four percent refused at any time to have any association with the male. The other 96% were by no means so uncooperative! The majority of hens overmate enormously.

It was, when I came to observe the behavior of the males that a number of interesting facts came to light. Some cocks just hadn't a clue! Others were as quick and as easy as a fowl. The time taken to complete a mating varied between 15 seconds and five minutes. In several instances no completed mating occured at all.

The first point that came to light from these observations, was that the ability to mate freely to some extent ran in individual families. That was a matter of straightforward pedigree breeding, to eliminate those families which had a proportion of males failing in this important function.

Further observation at this time, and over several different periods and on different farms, has indicated quite clearly that the slow mating cock at the beginning of the

* Presented at the meeting of the United Kingdom Branch of the World's Poultry Science Association held in London, England, March 29, 1957.

season, is the first one to give up altogether. The cock which mates quickly and easily is far more likely to stay the course throughout the whole breeding season. Few very sluggish cocks last any serious length of time at all.

The next step was to keep careful records of the physical conformation of all males under test. My work has to be done under practical conditions. It is not always easy to get all the data one wants. But pedigree records to which I have access largely bear out the qualified guess work which I have to make in dealing with purely commercial flocks.

Under practical conditions it is difficult to take a large number of conformation measurements of individual birds. Thus, the first thing that had to be done was to reduce the number of measurements to the minima required. The three essentials are breast width, shank and keel length.

A study of these conformation figures, and of fertility and mating speeds, indicated that there was a definite relationship between these factors. I am not presenting this paper as a completed work. It is more in the nature of a progress report. But most of the turkey cocks of real broad breasted type which I know to be fertile, have had conformation figures very close to the simple formula I shall give shortly. It does seem that it is possible to have a really broad breasted cock, 100% fertile, provided that he has balance, and balance, of course, is a matter of physical measurements.

Breasts can be as wide as you like, provided that the keel and shank lengths are co-related to breast width. A very wide breast with a very short keel and short shanks, will be infertile. On the other hand, an excess of bone is undesirable, and I think, unnecessary.

Far more rapid improvement can be made if the selection is in families rather than that of individual birds. Even with the minimum of pedigreeing, however, fertility should be uplifted, if keeping as close as possible to the following basic measurements. They are that the breast width should be "X" inches, the keel length "2X" inches, and the shank length also "2X" inches.

That is, of course, the broader the breast the bigger the turkey, but size all the time remaining in proportion to give a balanced bird.

INTERNATIONAL AWARD MADE

The Newman Trust International Poultry Award announces that the Award Committee in the United Kingdom has decided that the 1957 Award shall be made to Dr. Henry E. Adler, B.S., D.V.M., Ph.D. of the U.S.A. Dr. H. E. Adler is located at the Department of Poultry Pathology, School of Veterinary Medicine, University of California, Davis, California.

The Award was instituted nine years ago by Poultry Association of Great Britain and has been won six times by U.S.A. research workers and three times by United Kingdom workers. It consists of a handsome medal and £50 sterling. ling. It is given for what in the opinion of the Award Committee, meeting in the United Kingdom, is the most important contribution to poultry husbandry research work published in the previous year, for the benefit of poultry husbandry.

The Award was made to Dr. Henry E. Adler for his outstanding work in poultry pathology published in 1956.

Dr. Adler's contribution to knowledge of poultry diseases has been very real. His investigations during the past several years have contributed to a more improved understanding of the complex infections with organisms such as the pleuropneumonia-like organisms and a much better understanding of the mode of transmission and means of diagnosis and control of chronic respiratory disease of chickens and infectious sinusitis of turkeys.

Dr. Adler's work combines basic research with the practical application of the findings, both in his laboratory and elsewhere, to the problems of poultry production.

He was concerned in work published in 1956 as follows—

Adler, H. E., R. Yamamoto and S. R. Exstrom.—*Control of egg-transmitted pleuropneumonia-like organisms in two hatcheries through medication of the foundation stock.*

Adler, H. E., R. Yamamoto and D. R. Cordy.—*The effect of certain antibiotics and arsenicals in inhibiting growth of pleuropneumonia-like organisms isolated from goats and sheep.*

Adler, H. E. and R. Yamamoto.—*Preparation of a new pleuropneumonia-like organism antigen for the diagnosis of chronic respiratory disease by the agglutination test.*

Adler, H. E., W. J. Mathey and P. J. Siddle.—*The isolation of a pleuropneumonia-like organism from pigeons.*

Yamamoto, R. and H. E. Adler.—*The effect of certain antibiotics and chemical agents on pleuropneumonia-like organisms of avian origin.*

Adler, H. E. and R. Yamamoto.—*Studies on chronic coryza (Nelson) in the domestic fowl.*

Adler, H. E. and R. Yamamoto.—*A minced chicken embryo medium for cultivating pleuropneumonia-like organisms.*

REVIEW OF POULTRY PUBLICATIONS

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GENETICS

ABPLANALP, HANS. (U. California, Davis)
SELECTION PROCEDURES FOR POULTRY FLOCKS WITH MANY HATCHES. *Poultry Sci. 35(6):* 1285-1304. 1956.—Pullets of a closed population of Single Comb White Leghorn chickens showed significant differences in performance, depending on the date of hatching. An analysis of variance showed that interactions between parental genotypes and hatching date of pullets were relatively small for all production traits considered. Although the presence of hatch effects tended to lower heritability (and hence reduce effectiveness of mass selection) of the traits considered, it could be demonstrated that combined family and individual selection was but little affected by existing hatch effects.—*H. Abplanalp.* (Biological Abstracts)

BLYTH, J. S. S. (Poult. Res. Centre, Edinburgh.)
A CORRELATION BETWEEN EGG ALBUMEN WEIGHT AND SHANK WIDTH IN INBRED LINES OF BROWN LEGHORNS. *J. agric. Sci., 45:* 293-297, 1955.—In the inbred lines of a flock of Brown Leghorns, it was noted that the line means for albumen weight ranked in the same order as those for shank width. The parallelism was not due to the large differences in body weight existing between the lines. It was established that variations in albumen weight were more closely associated with changes in shank width than were those of yolk weight. It is possible, but not definitely established, that shell weight follows the behaviour of albumen in this respect. The dependence of albumen weight on shank width was less within lines than between lines, but there was no difference in trend between the two reciprocal regressions of shank on albumen.

The significance of the correlation between shank width and albumen weight is discussed, and the bearing on the differing behaviour of yolk and albumen on attempts to correlate body dimensions with egg production considered.—(Author)

COCK, A. G. (Sch. Agric., Univ. Cambridge.)
HALF-AND-HALF MOSAICS IN THE FOWL. *J. Genet., 53:* 49-80. 1955.—A full description is given of a crossbred R.I.R.× Light Sussex pullet in which the left shank was yellow and the right shank was white. The feathers of the left side were abnormal in structure and

slightly darker than those of the right side, and the left leg was very much shorter than the right. Possible causes of asymmetry in this and in other recorded cases are examined, special attention being paid to difficulties in applying the theory of Crew and Munro [*see A.B.A., 9:* 153 and 250] that half-and half mosaics are due either to elimination or nondisjunction of a single autosome at first cleavage. Some possible alternative explanations are offered. (Animal Breeding Abstracts)

COLES, R. 1956. (Minist. Agric. Fish. Food, London.)
PRIMARY AND SECONDARY SEX RATIOS IN DOMESTIC FOWL. *Emp. J. exp. Agric., 24:* 167-177.—Sexing records for 1954 were obtained from a number of hatcheries. Of 13,910,703 chicks sexed manually at hatching, 50.088% were ♂♂. At a hatchery producing autosexing chicks 51.9% of 41,768 chicks sexed by colour were ♂♂. Sex ratios in a flock of purebred White Leghorns managed by the author were recorded in 1954 and 1955 after inspection at 6-8 wks. In the 2 yrs. 71.4 and 77% resp. of the embryonic deaths occurred after the 10th day, by which time sex is distinguishable. Assuming the sex ratio to be equal in embryos not surviving the first 10 days, the primary sex ratios were 47.7 and 45.37% ♂♂ resp. in the 2 yrs. The secondary sex ratios were 48.7 and 49.1% resp. Only the primary sex ratios are significantly less than 50%. The results are considered in relation to pure- and cross-breeding, to hatching rate, month of hatching, and post-hatching mortality. "The only hypothesis which can be offered at present to explain the higher embryonic mortality of ♀ fowl is that there are sex-linked genes which influence only pre-natal not postnatal viability". (Animal Breeding Abstracts)

COLES, R. and CUMBER, F.
THE RELATIONSHIP BETWEEN FERTILITY, HATCHABILITY AND MORTALITY IN FOWL. *Brit. Vet. J., 1956, 112,* 491-496. [Minist. Agric., Fish. Food, London.]—The breeding records of a closed flock of White Leghorns for the past 7 years were examined. No relation was found between fertility and hatchability or postnatal mortality, or between hatchability and adult mortality. In some years, but not all, hatchability and rearing mortality seemed to be related. When this was so, low hatchability was found to be due to pathogenic infections which caused a high incidence of embryonic deaths about the 17th day. In the last 2 years the effect of different rations for layers was also studied. Some samples of white fishmeal contained bacteria capable of coagulating yolk, and reduced hatchability.—*T. D. Bell.* (Nutrition Abstracts and Reviews)

CZARNOWSKI, J. 1956. Wyniki zastosowania krzyzówki, zielononózek z kogutem saseks w PGR Jadwisin.
THE RESULTS OF CROSSING GREENLEG HENS WITH SUSSEX COCKS AT JADWISIN STATE FARM. *Przegl. hodowl., 24(3):* 40-41.—Sixty Sussex cocks were mated to 600 Greenleg hens. Although the percentage of fertile eggs was lower than that obtained with Greenleg cocks (possibly due to difficulties in mating with the rather small Greenleg hens on the farm), egg hatchability was 3-5% higher. The crossbred chicks had longer and denser down than Greenleg chicks, resulting in better temp. regulation; they were approx. the same weight as the Greenlegs (35-37 g).

Mortality was about 40% less in crossbred than in Greenleg fowls; the crossbreds were also superior in growth rate and in efficiency of food utilisation. They reached a weight of 1 kg. in 80 days, about 14 days earlier than the Greenleg. At 6 mths. crossbred cockerels weighed 1.6-2 kg. *v.* 1.3-1.6 kg. for Greenlegs. Meat quality was also better. Ninety-five per cent of the crosses had flesh-coloured legs; the other 5% had yellow legs.

Crossbred pullets came into lay sooner and produced 10-12% more eggs than did Greenleg pullets. Apart from the first eggs, which were larger in the crosses, egg size was similar in pure and crossbred birds. One disadvantage of the crossbreds was their well-developed broody instinct. (Animal Breeding Abstracts)

DERANIYAGALA, P. E. P. 1953
HYBRIDIZATION IN THE JUNGLE FOWL OF CEYLON. *Spolia zeylan., 27:* 59-61.—A Ceylon jungle fowl (*Gallus lafayetti*) cock mated with a large-sized, wheaten-coloured, Old English Game Bantam hen produced 3 broods, consisting of 2, 4 and 2 young resp. The hybirds (4 cocks and 4 hens) all reached maturity and when mated *inter se* produced 2 broods (1 chick and 2 chicks resp.). The F_1 and F_2 birds are described.

The F_1 hybrids all had dorsal stripes, were capable of flying considerable distances when young, and normally perched high up on trees. The ♂♂ inherited the black spurs of the jungle cock. The yellow comb patch of the jungle fowl occurred in about one quarter of the F_1 hybrids, although much reduced in size. The plumage of young ♂♂ was wheaten, like their Bantam mother. The crow showed characteristics of both parental species, but mostly resembled that of the domestic cock. The clucking-note of the ♀ hybrid closely resembled that of the ♀ jungle fowl. About 1 ♀ in 4 laid speckled eggs and a similar proportion laid their eggs in elevated places. All had pencilled plumage, like their ♀ parent. The F_2 chicks were more timid than the F_1. Like the F_1 they had dorsal stripes and black spurs, and the ♀♀ had pencilled plumage. (Animal Breeding Abstracts)

DUZGUNES, O., and **T. S. YAO.** (U. Nebraska, Lincoln.)
THE INFLUENCE OF A LONG HATCHING SEASON ON THE EFFECTIVENESS OF SELECTION FOR EGG PRODUCTION IN CHICKENS. *Poultry Sci. 35(6):* 1309-1315. 1956.—The egg production indexes of 816 Single Comb White Leghorn pullets hatched during 11 weeks in 1954 were used in this study. These were adjusted by using least squares method for the influences of hatching date and laying house. The adjusted and unadjusted data were analyzed separately for variance components from which heritability estimates and phenotypic correlations among full-sisters were obtained. Expected genetic gains per generation for (1) mass selection, (2) combined family and individual selection of dams. (3) selection of sires based on full-sisters' averages: and (4) combined selection of(1) and (3), and of (2) and (3) were calculated. All variance components, heritability estimates, and expected genetic gains obtained from adjusted data were compared to those obtained from unadjusted records. Results showed that no substantial extra genetic gain could be expected by the adjustment. However, a combined selection, based on dams' individual and family performance for selecting dams and based on sires' family performance for selecting sires, can increase genetic gain from 11.98 up to 12.59 eggs per generation, when records are adjusted for hatching date and house effects. Results obtained also furnished evidence for the existence of maternal effects on egg production indexes.—*T. S. Yao.* (Biological Abstracts)

ERASMUS, J. E. (Poult. Res. Centre, Edinburgh.)
RELATIONS OF YOLK, ALBUMEN AND EGG WEIGHT IN INBRED LINES OF BROWN LEGHORNS. *J. agric. Sci., 45:* 32-35, 1954.—The relations of yolk, albumen and egg weight were studied in 7 inbred lines of Brown Leghorns and reciprocal crosses of 2 of these lines. In all the lines the eggs produced by hens had a bigger proportion of yolk than those produced by pullets. Besides changes in components accompanying differences in egg size the line means for albumen weight still differ significantly after adjustment is made for its covariance with yolk weight. This independent variation leads to differences in the yolk/albumen ratio of the hens.

Within the lines there is a significant negative association between egg size and the yolk/albumen ratio. The wide differences in egg size, dividing the pure lines into 2 groups characterised by large and small eggs resp., resulted from a marked decrease in the amount of albumen in the eggs of the latter group. Yolk weights, on the other hand, could be ranked in a fairly regular series with adjacent lines differing by 2 g. or less. There is some source of variation in the yolk/albumen ratio

for line means which is not accounted for by differences in egg size.—(Author)

ERASMUS, J. E. (Poult. Res. Centre, Edingurgh.)
SHELL POROSITY AND SHELL THICKNESS IN INBRED LINES OF BROWN LEGHORN FOWLS. *J. agric. Sci., 45:* 28-31, 1954.—Egg shells from 6 inbred lines of Brown Leghorn fowls were examined for porosity and thickness in March and in July. For both characters studied the variation between line means was found to be significant. The line means for thickness were with a single exception lower in July. Porosity coefficients increased from March to July. No significant relationship between shell thickness and porosity was found in either season. Line differences in porosity values are therefore attributable to variations in other properties of the shell. —(Author)

FABER, H. v. 1955. (Zool. Inst., Landw. Hochsch., Stuttgart-Hohenheim.) Uber den extremen Geschlechtsdimorphismus im Wachstum der Moschusente, *Cairina moschata* Flemm. I. Die innersekretorischen Organe.
EXTREME SEX DIMORPHISM IN THE GROWTH OF THE MUSCOVY DUCK, *CAIRINA MOSCHATA* FLEMM. I. THE ENDOCRINE ORGANS. *Acta endocr.* [*Copenhagen*], *20:* 391-399.—Five ♂♂ and 5 ♀♀ hatched in July 1954 were killed at 12 wks., when live weight averaged 3044 and 1803 g. resp. The absolute weight of each organ of inner secretion was greater in ♂♂ than in ♀♀. Histologically the only appreciable sex difference was in the anterior pituitary. The weight of the testes averaged 247 mg.; no advanced stage of spermatogenesis was noted. Ovarian weight averaged 204 mg. (Animal Breeding Abstracts)

FREY, O. 1956. (Inst. TierzLehre, Landw. Hochsch., Hohenheim.) Untersuchungen über die Möglichkeiten einer Vorhersage der Leistung von Hühnern auf Grund der Ahnen- und Geschwisterleistungen.
THE POSSIBILITIES OF PREDICTING THE PERFORMANCE OF COCKERELS ON THE BASIS OF THE PERFORMANCE OF THEIR ANCESTORS AND SISTERS. *Arch. Geflügelk., 20:* 194-232. [English summary.]—All calculations were based on the egg yields during their 1st laying year of pullets belonging to the registered flocks of White and Brown Leghorns at the Institute of Animal Breeding in Hohenheim from 1947-48 to 1952-53. The performance of 12 breeding cockerels was evaluated by 8 different methods which are described, and the results were related to those obtained by the standard method (dam-daughter comparison). The best method was found to be one which took into consideration the performance of the cockerel's sisters and also that of his sire and dam. Prediction by means of the av. yields of sisters was more accurate when there were larger numbers of sister groups available than when there were fewer. A prediction of the breeding worth of a cockerel is much more accurately made on the basis of egg weight than of egg number. (Animal Breeding Abstracts)

GUHA, SYAM RUNJAN. (U. Illinois, Urbana.)
THE EFFECT OF ENVIRONMENT ON THE EXPRESSION OF HEREDITARY RESISTANCE TO SALMONELLA PULLORUM IN CHICKENS. *Dissertation Absts. 16(2):* 214. 1956. (Biological Abstracts)

HARMS, I. (Landesgeflügelz. Anst., Landw. Hochsc., Hohenheim.) Untersuchung über die Bezichungen zwischen Kurzperiodenleistungen und der Jahreslegeleistung und ihre Bedeutung für die frühzeitige Beurteilung von Zuchthähnen nach dem sogenannten Erbgitterverfahren.
AN ANALYSIS OF THE RELATION BETWEEN SHORT PERIOD AND ANNUAL EGG PRODUCTION AND ITS SIGNIFICANCE FOR THE EARLY EVALUATION OF BREEDING COCKERELS BY THE SO-CALLED INHERITANCE GRID METHOD. *Arch. Geflügelk., 19:* 17-72, 1955.—The birds used in this experiment

were taken from three poultry herdbook- and reproduction breeding stations. Farm (A and B) supplied white leghorn and farm (C) brown leghorn.

Altogether 48 breeding cocks and 6624 hens in the first laying year, being entered in the hen herdbooks from 1934-1951, were controlled according to their part winter egg production (October 1st to December 31st), total winter egg production (October 1st to February 28th), and total annual egg production (October 1st to September 30th). Besides the absolute egg production the relative production was determined too in this experiment in order to exclude any influence of the surroundings. For a comparison the average egg production of all hens of the same age in the same farm was assigned the value of 100.

Correlations are given for the part winter egg production (PWEP) or total winter egg production (TWEP) and the total annual egg production (TAEP).

After division into production classes it was also found that close relations exist between short period- and annual productions. It is recommended for the practice to select the hens according to their relative winter production rather than according to the absolute number of eggs produced. Birds which do not reach in their TWEP 60% of the average of the flock should be culled as most of them do not reach a satisfactory annual production.

The same examinations were carried out with the hens divided into 868 sister groups.

It is recommended to remove such sister groups, which do not reach 40 eggs in their average absolute TWEP, 20 eggs in their PWEP, while for the relative values for the TWEP again 60% and for the PWEP 40% of the average of the flock can be given as limit.

From groups which are below this limit no satisfactory TWEP can be expected.

For 48 breeding cocks the hereditary value were determined from their scatter diagram, and that on basis of the PWEP, TWEP and TAEP of the mother/daughter groups. The result was that only the conclusions drawn from the PWEP for 8 out of 100 cocks were wrong and that only four out of 100 did not reach the hereditary value in the TAEP which was estimated according to the TWEP.

This shows that there is a possibility to forecast the hereditary value of breeding cocks owing to the production of their daughters over a short period with considerable certainty. (English Summary)

HOWES, C. E., and **F. B. HUTT.** (Cornell U., Ithaca, N. Y.)
GENETIC VARIATION IN EFFICIENCY OF THIAMINE UTILIZATION BY THE DOMESTIC FOWL. *Poultry Sci. 35(6):* 1223-1229. 1956.—Microbiological assays of thiamine in the yolks of 196 eggs from 74 hens of the genotype k-- and their 62 full sisters of the genotype k-- showed that these genes, which cause rapid feathering and slow feathering respectively, have no influence on thiamine utilization as measured by amount of that vitamin deposited in the egg. Fifty hens, from each of which 2 eggs laid 31 days apart were assayed, were remarkably consistent in the amount of thiamine put in their eggs. The correlation between figures for the 2 eggs were r= +.79. Among 30 dams' families highly significant differences were found in thiamine content of their eggs. Using the thiochrome test, and eggs from 13 strains of White Leghorns and 13 strains representing 4 heavy breeds, mean thiamine content of the former was 1.98 μg/gram of yolk, a figure 43% higher than the mean of 1.38 μg for the heavy breeds. This highly significant difference confirms earlier evidence that White Leghorns use thiamine more efficiently than heavy breeds do. Differences among heavy breeds or among strains of White Leghorns were not significant.—*F. B. Hutt.* (Biological Abstracts)

JAAP, R. GEORGE. (Ohio Agric. Expt. Sta., Columbus), and **JOHN F. GRIMES.** (Nichols, Inc., Kingston, N. H.)
GROWTH RATE AND PLUMAGE COLOR IN CHICKENS. *Poultry Sci. 35(6):* 1264-1269. 1956.—Five different matings which pro-

duced 19,221 progeny were used to study effect of plumage color genes on body weight of chickens at 8 weeks of age. The gene, I (inhibitor of black color in the plumage) interacts with E (extension of black color throughout the plumage) to reduce body weight. A further growth suppression occurs in the presence of gene B which produces white bars across colored feathers. This detrimental effect of B is eliminated in males heterozygous for the b+ allele. The question was raised whether this growth suppressing interaction of I, E, and B might be an extension of a similar effect these genes appear to exert on specific pigment producing cells, melanophores. The gene S, which suppresses red plumage color, and/or the closely linked gene K which delays development of definitive feathers, appeared to suppress growth rate independently of genes I, E, and B.—*R. G. Jaap.* (Biological Abstracts)

JEROME, F. N. (Ontario Agric. Coll., Guelph, Canada), **C. R. HENDERSON** (Cornell U., Ithaca, N. Y.), and **S. C. KING.** (Purdue U., Lafayette, Indiana.)
HERITABILITIES, GENE INTERACTIONS, AND CORRELATIONS ASSOCIATED WITH CERTAIN TRAITS IN THE DOMESTIC FOWL. *Poultry Sci. 35(5):* 995-1013. 1956.—The records from 1484 individual progeny involving 108 sires and 237 dams were analyzed using variance component techniques. Heritability estimates for the traits studied compared favorably with those obtained by other investigators with the exception of that for total first laying year production where the estimate was only 0.12. A high proportion of non-additive variance contributed to the variation of the trait, total first laying year production. A negative genetic correlation of -0.59 was found to exist between the traits, fall body weight and total first laying year production. —*F. N. Jerome.* (Biological Abstracts)

JOHNSON, A. S. 1956. (Poult. Div. Exp. Farms Serv., Ottawa.)
GENETIC AND SEASONAL VARIATION IN INCIDENCE OF BLOOD AND MEAT SPOTS IN CHICKEN EGGS. *Canad. J. agric. Sci., 36:* 390-393.—The incidence of blood and meat spots in the eggs of Barred Rocks and blood spots in those of White Leghorns was determined from Nov. 1948 to Aug. 1949 by breaking out about 23,000 eggs. There was a seasonal trend in the incidence of both characters, the peak occurring in the late spring. Heritability estimates of blood spots calculated from variance components averaged 0.211 for W.L.s and 0.066 for Barred Rocks and of meat spots 0.250 for B.R.s. There were marked differences between sire groups in the relative percentages of blood and meat spots, indicating that they are different entities. (Animal Breeding Abstracts)

KODINEC, G. A. 1956. (Kherson Agric. Inst.) Kury-goloseiki.
NAKED NECK FOWLS. *Priroda* [*Mosk.*], *45(8):* 102-105.—Naked Neck fowls are not bred in the U.S.S.R. except by bird fanciers. Reference is made to breeding them in Germany and Hungary. At the Farm Lepoglava in Yugoslavia the percentages of eggs fertilised and hatched and of chicks reared were higher for Naked Necks than for Leghorns, Plymouth Rocks or Rhode Island Reds. The Naked Necks averaged 140-180 eggs per year, each egg averaging 58-70 g. They are also good meat birds, the meat having a good flavour; they fatten easily and utilise food efficiently. It is suggested that they should be bred around the Black Sea. (Animal Breeding Abstracts)

LEMCKE, R. 1954. (Inst. Tierz. Vererb-Forsch., Tierärztl. Hochsch., Hanover.) Vererbung und Erbgang der Farbe bei Reisetauben.
INHERITANCE OF COLOUR IN RACING PIGEONS. *Vet.-med. Dissertation, Tierärztl. Hochsch., Hanover.* 39 pp.—By means of test matings and by an examination of the records of various pigeon breeders, a study was made of the inheritance of colour and colour patterns in racing pigeons. Two major pigment groups were distinguished: *A*, which denotes the presence of red pigment, and *B*, which denotes the presence of black pigment. *A* is dominant over *B*, and is sex-linked. Within these

pigment groups are various factors which determine the degree of pigmentation. Among the characters whose inheritance was studied were black bluetail *(T)*, dark check *(Cd)*, light check *(Cl)*, banded *(c)* and grizzle *(G)*. Black-bluetail, dark check and light check are dominant over banded. Grizzle is dominant over dark check, light check and banded. (Animal Breeding Abstracts)

LERNER, I. MICHAEL, and **EVERETT R. DEMPSTER.** (U. California, Berkeley.)

AN EMPIRICAL TEST OF PART-RECORD SELECTION FOR EGG PRODUCTION. *Poultry Sci. 35(6):* 1349-1355. 1956.—The hypothesis that selection for egg production based on breeding from pullets is a more efficient procedure than one based on breeding from yearling hens was put to a limited test. Due to a number of complications it cannot be considered unequivocally proven, though nearly all of the data favor it. The pullet-bred line was superior to the hen-bred line in reproductive performance and in average hen-housed as well as survivors' production. Laying house mortality, however, was lower in the hen-bred group, a fact possibly related to its lower inbreeding coefficient. In general, results obtained suggest that pullet breeding is a practical and desirable procedure in combined family and individual selection for egg production.—*I. M. Lerner.* (Biological Abstracts)

LOWRY, DOROTHY C., I. MICHAEL LERNER, and **LEWIS W. TAYLOR.** (U. California, Berkeley.)

INTRA-FLOCK GENETIC MERIT UNDER FLOOR AND CAGE MANAGEMENTS. *Poultry Sci. 35(5):* 1034-1043. 1956.—In an experiment extending over 4 years, means and variabilities of egg production traits of pullets housed in floor pens were compared with means and variabilities of their full sisters housed in individual cages. Floor pullets were found usually superior in performance for the mean production of survivors while caged pullets showed lower mortality, heavier eggs and a higher incidence of blood spots. Conistent significant differences could not be demonstrated for the production index or for sexual maturity, nor was there evidence of differences in variability under the 2 managements. Lack of any evidence for interaction between genotype and management implies that, under the conditions of the test and the genetic material studied, selection under floor management for performance in cages and selection under cage management for floor performance are equal in efficiency to direct selection.—Authors. (Biological Abstracts)

LUBNOW, E. 1956. (Zool. Inst., Bonn.) Die Bindegewebspigmentierung des japanischen Seidenhuhns.

THE PIGMENTATION OF THE CONNECTIVE TISSUE IN THE JAPANESE SILKIE FOWL. *Verh. dtsch. Zool. Ges.,* 1955 *(Zool. Anz., Suppl. 19):* 281-285.—The Silkie fowl is characterised by black pigmentation of the connective tissue. This character is inherited independently of feather pigmentation and is due to a dominant factor, *P*. Pigmentation is first observed on the 5th day of incubation, in the head and lumbosacral region, from which it spreads to other parts of the body. Melanocytes are present not only in the connective tissue, but also in certain tissues which are directly formed from it (*e.g.* fatty tissue).

Pigmentation of the connective tissue has also been observed in Leghorn embryos, but here the colour is rather faint and has disappeared before the 14th day of incubation. (Animal Breeding Abstracts)

MAW, A. J. G. (Pensylvania State U., University Park), and **M. G. McCARTNEY.**

VARIATION IN FERTILITY ON INBREED CHICKENS AND OF FERTILITY AND HATCHABILITY IN WHITE HOLLAND TURKEYS. *Poultry Sci. 35(6): 1185-1190.* 1956.—Observations on duration of fertility in inbred chickens following single artificial inseminations indicated that certain inbred lines have definite genotypes with respect to fertility. Both males and females were found to influence

duration of fertility. In turkeys the absence of family differences in fertility and hatchability suggests that selection for these characters in the strain used would provide little improvement. There was a significant difference between 2 successive insemination periods. The significant family X mating period interaction indicates that certain families responded differently to the 2 inseminations.—*A. J. G. Maw.* (Biological Abstracts)

MEHNER, A. 1956. Ergebnisse bei der Prüfung von Hy-Line-Hühnern. RESULTS OF TESTING HY-LINE HENS. *Arch Geflügelk., 20:* 282-288. [English summary.]—In spring 1954, 3030 hatching eggs were obtained from a Dutch firm at Boxmeer and distributed among 5 German research centres. Hatchability was generally good (79-87.3%). From 1st Oct. 1954 to 30th Sep. 1955, 724 hens were trapnested. Production at the 5 centres ranged from 203 to 255 eggs with an av. weight of 55.8-59.4 g. When calculated on a hen-housed basis this could be regarded as satisfactory. Comparisons between the imported Hy-line hens and Hy-line hens bred in Germany showed that the latter gave equally good performance. However, since deaths from leucosis among the Hy-line hens were particularly heavy, the more widespread use of them in Germany is not recommended. (Animal Breeding Abstracts)

MORRIS, J. A. (C.S.I.R.O., Poultry Res. Centre, Werribee, Victoria.) GENETIC PARAMETERS ASSOCIATED WITH CHARACTERS AFFECTING EGG PRODUCTION IN THE DOMESTIC FOWL. II. HERITABILITY OF EGG PRODUCTION FOR TWO PART-ANNUAL PERIODS OF MEASUREMENTS AND THE GENETIC CORRELATION BETWEEN THEM. *Australian Jour. Agric. Res. 7(6):* 630-639. 1956.—Estimates of important genetic parameters have been obtained from an experimental flock using data collected over a period of 3 years. A total of 1784 progeny, obtained from 42 sires and 383 dams, supplied records for analysis. The information was mainly extracted using the analysis of variance and covariance from which estimates of genetic variance and covariance were obtained. Pooling the results within years and, when applicable, within breeding groups, estimates of heritability were obtained as follows: Production Index: part period, 32 per cent.; 72 weeks, 31 per cent. Survivor Index: part period, 33 per cent.; 72 weeks, 33 percent. The low mortality rate should be borne in mind when comparing the estimates for the Production Index with those obtained by other workers. The estimated genetic correlation between the Production Index for these two periods was 0.72. The magnitude of the heritability estimates the presence of a considerable amount of additive genetic variation. The proportion of this type of genetic variation has probably been increased by the minimizing of environmental variation effected by the randomization of birds over the housing space and, in the case of the part period of recording, by the corrections applied for hatching date influence. Early selection, based on partial records, has been shown to be approximately 1½ times as effective in producing genetic improvement as selection based on the full production.—Authors. (Biological Abstracts)

MOULTRIE, FRED, G. J. COTTIER, and **D. F. KING.** (Agric. Expt. Sta. Alabama Polytech. Inst., Auburn.) THE EFFECTS OF RELAXED SELECTION ON PERFORMANCE OF A STRAIN OF DISEASE RESISTANT WHITE LEGHORNS. *Poultry Sci. 35(6):* 1345-1348. 1956.—A random sample population originating from a disease-resistant strain of White Leghorns was reproduced for 3 generations with no intended genotypic or phenotypic selection and was compared in each generation to the original strain in which selection was continued. After 3 generations of this relaxed selection, there was a strain difference of 12.2% in mortality from 1 through 500 days of age and a strain difference in first-year production of 28 eggs/bird housed.—*F. Moultrie.* (Biological Abstracts)

PEREHREST, A. G. 1955. (Kiev Zool. Park.) Gibridy fazanov. HYBRID PHEASANTS. *Priroda [Mosk.], 44(5):* 109-110.—At

the Kiev Zoological Park in 1950 a Golden Pheasant ♂ and Diamond Pheasant ♀ were isolated. The ♀ laid 9 eggs, 8 of which were fertile. The bantam under which they were incubated destroyed 5 eggs; 3 ♂ ♂ were hatched after 24 days' incubation. All developed normally and had the beautiful plumage of both parent breeds. (Animal Breeding Abstracts)

PIGAREV, N. V., and **NADINSKAJA, O. N.** 1956. (All-Un. Res. Inst. Poult. Breed. Ind.) Otbor kletocnyh nesusek po dannym periodiceskogo uceta jaicenoskosti.

THE SELECTION OF HENS IN BATTERIES BY THE PERIODIC RECORDING OF EGG PRODUCTION. *Pticevodstvo, 6(9):* 36-38. —In Oct. 1954 at the State Farm for Poultry Breeding Zendikovo 2 groups of 5- to 6-mth-old pullets were put into batteries. In Aug. 1955 production was not appreciably different in the 2 groups; 276 pullets were culled from each group resp. on the basis of having laid less than 10 eggs in July or on the basis of external characters. In Sep. the production of the hens culled by the 2 different methods averaged 650 and 1185 resp. When the first year's production of a further 436 ♀♀ was analysed it was apparent that in the first 4 mths. production of poor and av. layers was appreciably lower than that of good layers and that the differences increased in later months. Coefficients of correlation between production in the 1st, 3rd, 5th or 7th mth. and in all months subsequent to each of these were not appreciably different and were not statistically significant; the correlation between production in the 9th and in the 3 subsequent months was statistically significant. It is concluded that culling should be on the basis of egg production and not on that of external characters, and that, as differences in production increase, no pullets should be culled until they have been in production for at least 4 mths. (Animal Breeding Abstracts)

SHELDON, B. L. (U. Sydney.)

GENETIC PARAMETERS ASSOCIATED WITH CHARACTERS AFFECTING EGG PRODUCTION IN THE DOMESTIC FOWL. I. HERITABILITY OF TOTAL EGG PRODUCTION DURING THE PULLET YEAR. *Australian Jour. Agric. Res. 7(6):* 625-629. 1956.—Egg production records of White Leghorn pullets hatched at the Poultry Research Centre, Werribee, Vic., during 1947 to 1950 inclusive have been analysed both on a hen-housed (Production Index) and a survivor basis. Estimates of heritability were obtained by two methods: (1) by the analysis of components of variance between families of full sibs and half-sibs; (2) by estimating the intra-sire regression of the mean performance of offspring on dam's performance. Heritability, in the narrow sense, of Production Index during the pullet year is shown to be 25-30 per cent. with a reasonably low standard error, while heritability of survivors' production is slightly lower but not significantly so. Possible reasons are advanced for the low estimates of heritability of survivors' production.—Author. (Biological Abstracts)

WEBER, F., and **LE ROY, H. L.** 1956. (Versuchsgut Tierz., Eidg. Tech. Hochsch. Zürich, Chamau.) Wechselwirkungen zwischen Erbgut und Umwelt beim Haushuhn und ihre Bedeutung für die Umweltgestaltung bei Leistungsprüfungen.

INTERACTIONS BETWEEN HEREDITY AND ENVIRONMENT IN THE DOMESTIC FOWL AND THEIR BEARING ON ENVIRONMENTAL CONDITIONS IN PERFORMANCE TESTS. *Arch. Geflügelk., 20:* 1-14. [English summary.]—Data from a random sample test held during 1954-55 at the Chamau Experimental Farm were used for a statistical analysis. The performance of hens, based on egg production from the commencement of laying to 9th Jan. 1955, egg weight in Dec., and body weight at 10 wks., was correlated with that of their full sisters on 3 other farms. When the actual correlations obtained were considerably lower than the theoretical correlations (based on the assumption that there is no interaction between heredity and environment), interactions were assumed to exist. In this study, inter-

actions probably did not occur for egg number, they require more careful study for egg weight and probably did occur in 10-wk. body weight. It was concluded that performance tests designed to test sexual maturity, amongst other things, should be carried out in an environment as similar as possible to where the birds will eventually live. (Animal Breeding Abstracts)

WHEAT, J. D. 1956. (Dep. Anim. Husb., Iowa State Coll., Ames.)
ACCURACY OF PARTIAL TRAPNEST RECORDS AS A BASIS FOR SELECTING WHITE LEGHORN HENS FOR EGG PRODUCTION. *Iowa St. Coll. J. Sci., 30:* 452-453.—The data studied were from Kimber Poultry Breeding Farm, Niles, California. They consisted of daily, monthly and annual production records for 403 intensely selected hens and the annual records for their first 5 daughters which lived at least 30 days beyond the 365-day laying period. Close inbreeding was avoided.

Repeatability of daily egg production was the only biological factor which affected the accuracy of partial trapnesting. The accuracy of partial records in estimating annual production was 0.85, 0.93, 0.96, 0.98, 0.99 and 0.99 of that for complete records when the number of trapnesting days per week was 1, 2, 3, 4, 5 and 6 days resp. The correlations between the rates of lay in 4 selected periods—1st egg to 30th Nov., 1st Dec. to 31st March, April to July (inclusive), and 1st Aug. to end of 1st production year—and annual rate were 0.33, 0.49, 0.86 and 0.46 resp. The heritability estimate for annual egg production obtained by doubling the intra-sire regression of daughter on dam was 0.230, and that obtained by doubling the full sib correlation was 0.183. When annual production is based on the records for 1 to 6 days per week, the expected genetic gains per generation of selection by truncation (when heritability is 0.183 and 20% of the ♀♀ are selected) range from 7.08 to 8.26 eggs (*v.* 8.33 with complete records), and the expected annual gains range from 4.24 to 4.95 eggs (*v.* 4.99 with complete records). (Animal Breeding Abstracts)

PHYSIOLOGY

BIELLIER, HAROLD VICTOR. (U. Missouri, Columbia.)
THE THYROID SECRETION RATE OF DOMESTIC FOWL AS DETERMINED BY GOITROGEN AND RADIOIODINE TECHNIQUES. *Dissertation Absts. 16(3):* 556-557. 1956. (Biological Abstracts)

BRACE, KIRKLAND C., and **PAUL D. ALTLAND.** (Natl. Insts. Health, Bethesda, Md.)
LIFE SPAN OF THE DUCK AND CHICKEN ERYTHROCYTE AS DETERMINED WITH C^{14}. *Proc. Soc. Exptl. Biol. and Med. 92(3):* 615-617. 1956.—The mean life span of the chicken cells was 20 days and the mean life span of the duck cells was 39 days.—*Kirkland Brace.* (Biological Abstracts)

BRANT, J. W. A., and **A. V. NALBANDOV.** (U. Illinois, Urbana.)
ROLE OF SEX HORMONES IN ALBUMEN SECRETION BY THE OVIDUCT OF CHICKENS. *Poultry Sci. 35(3):* 692-700. Illus. 1956.—Immature female pullets 60-70 days of age were injected with varying amounts of estrogen alone, progesterone alone or androgen alone and with combinations of estrogen and progesterone or estrogen and androgen. Each of the 3 hormones when injected alone caused increased oviducal weight. Neither progesterone nor androgen alone was able to cause differentiation or proliferation of the albumen secreting glands. Estrogen alone was able to cause gland proliferation. When given alone, none of the hormones used was able to induce formation of secretion granules within the glands. To induce formation of secretion

granules within the glands and the secretion of albumen into the lumen combinations of estrogen and progesterone or estrogen and androgen were required. There was no evidence of antagonism between estrogen and progesterone but such antagonism did exist when higher doses of androgen were given with estrogen. This was reflected in diminished morphological and physiological effectiveness of the estrogen-androgen combination. The estrogen-progesterone combination was more efficient in inducing morphological and physiological development of the magnum. Whether progesterone plays the same role in normal laying hens remains unknown.—*A. V. Nalbandov.* (Biological Abstracts)

CAMMAYO, J. G. 1954. (Dep. Anim. Husb., Univ. Philippines, Laguna.) COMPARISON OF THE RATES OF GROWTH AND MORTALITY OF NEW HAMPSHIRE AND SINGLE COMB WHITE LEGHORN CHICKENS. *Philipp. Agric., 38:* 181-190.—Between March 1953 and Feb. 1954, 4 trials each lasting 12 wks. were carried out with 75 ♂ and ♀ chicks of each breed. Chicks were weighed weekly. Throughout the experiment the N.H.s had higher av. weights than the W.L.s except in 1 trial in which the Leghorn ♀♀ were heavier than the N.H.♀♀. The Leghorns, however, had a more efficient rate of food conversion. Mortality of N.H.s averaged 30.3% *v.* 41.3% for W.L.s. (Animal Breeding Abstracts)

FABER, H. V. (Zool. Inst., Landw. Hochsch., Stuttgart-Hohenheim.) Die anormale Federstruktur bei Ausstellungs-Rhodeländern and ihre Ursache.

ABNORMAL FEATHER STRUCTURE IN EXHIBITION RHODE ISLAND REDS AND ITS CAUSE.) *Arch. Geflügelk. 19:* 13-16, 1955.

A peculiar change in the structure of feathers by Rhode Island Red Pullets is being described, which corresponds with the changes after thyroidectomy. The histological examination of the thyroid gland and the feeding of thyroxin showed that the loosened structure of the feathers is not caused by an hereditary hypotrophy of the thyroid gland but that it is genetical. (English Summary)

FUNK, E. M., and **J. E. SAVAGE.** (U. Missouri, Columbia.) THE INCIDENCE OF BREAST BLISTERS AS RELATED TO THE AMOUNT OF BREAST FEATHERING. *Poultry Sci. 35(6):* 1399-1400. 1956.—Observations made on White Plymouth Rock cockerels at 12 and 14 weeks of age showed that breast blisters were more common in birds poorly feathered over the breast than in birds having breasts well covered with feathers. Removing the breast feathers increased the incidence of breast blisters.—*E. M. Funk.* (Biological Abstracts)

GENELLY, R. E., and **R. L. RUDD.** (U. California, Davis.) EFFECTS OF DDT, TOXAPHENE, AND DIELDRIN ON PHEASANT REPRODUCTION. *Auk 73(4):* 529-539. 1956.—Breeding groups of ring-necked pheasants were fed different levels of three insecticides—DDT at 100 and 400 ppm; toxaphene at 100 and 300 ppm; and dieldrin at 25 and 50 ppm. Each group was compared with controls in regard to egg production, fertility, hatchability, and survival of young. Egg production was depressed significantly (0.05%) at levels of 300 ppm toxaphene and both levels of dieldrin. Egg fertility of the 50 ppm dieldrin group and hatchability of the 300 ppm toxaphene group were significantly lower than controls. Mortality of young in each test group was significantly greater than controls for the first two weeks after hatching. Chemical concentrations in eggs ranged from 3 to 349 ppm. Total reproductive success ranged from 70% for controls to 38% in the 50 ppm dieldrin group.—*R. L. Rudd.* (Biological Abstracts)

HERRICK, R. B., and **J. L. ADAMS.** (U. Wisconsin, Madison.) THE EFFECTS OF PROGESTERONE AND DIETHYLSTILBESTROL INJECTED SINGLY OR IN COMBINATION ON SEXUAL LIBIDO AND THE WEIGHT OF THE TESTES OF SINGLE COMB WHITE LEGHORN COCKERELS. *Poultry Sci. 35(6):* 1269-1273. 1956.

—Three groups of 6 males each were injected twice weekly with the following hormone levels: group 1: progesterone—20 mg; group 2: diethylstibestrol—5 mg; group 3: progesterone—20 mg plus diethylstilbestrol—5 mg; and group 4: (control) no injections. Mating behavior observations were made twice weekly. Individual trials were made once each week and group trials were carried out the alternate time each week. The number of matings completed was recorded during each trial. The males were killed after a 12 week period, and the testes weighed and examined for the presence of spermatozoa. Progesterone depressed testes weights and mating behavior significantly. Diethylstibestrol depressed testes weights, but did not affect mating behavior. The combination of progesterone and diethylstilbestrol depressed testes weights more than either hormone alone, but did not depress mating behavior. The number of spermatozoa was reduced by progesterone treatment. No spermatozoa were observed in any birds treated with diethylstilbestrol either alone or in combination with progesterone. Body weight was not affected significantly by the administration of either diethylstilbestrol or progesterone alone or in combination.—*R. B. Herrick.* (Biological Abstracts)

JOWSEY, J. R. (Poultry Div., Dominion Exptl. Farm, Swift Current, Saskatchewan, Canada.), **M. R. BERLIE, J. W. T. SPINKS,** and **J. B. O'NEIL.**

UPTAKE OF CALCIUM BY THE LAYING HEN, AND SUBSEQUENT TRANSFER FROM EGG TO CHICK. *Poultry Sci. 35(6):* 1234-1238. 1956.—Calcium analyses for a number of fractions of 2 newly-hatched chicks provide a measure of the distribution of Ca in the body of the chick at this stage of its life. Approximately 5% of the Ca of the egg shell is withdrawn by the embryo during incubation. Investigation of the rate of deposition of Ca on egg shells and excretion of Ca by the bird was carried out with radiocalcium (Ca^{45}). Results obtained with the 2 birds in the experiment indicate that: (1) about 60% of the Ca ingested is excreted during the 24-hour balance period: (2) a laying hen depositing Ca on the shell of an egg will obtain about 35% of the Ca for this shell from the food in the gut (3) labeled Ca in the "replacable skeletal calcium" approaches a maximum after 26 days' feeding of Ca^{45} in the Ca supplement.—*J. R. Jowsey.* (Biological Abstracts)

KHEIR EL DIN, MAHMOUD ABDOU. (U. Maryland, College Park.)

A GENETIC AND PHYSIOLOGIC STUDY OF SOME ASPECTS OF THE CHICK THYROID GLAND OF THE RESISTANCE OF YOUNG CHICKENS TO CONDITIONS OF STRESS. *Dissertation Absts. 16(7):* 1269. 1956. (Biological Abstracts)

KINNEY, TERRY B., J. ROBERT SMYTH., Jr. and **THOMAS W. FOX.** (U. Massachusetts, Amherst.)

RELATION BETWEEN TURKEY BREAST WIDTH AS MEASURED AT A CONSTANT DEPTH AND AT A PERCENTAGE OF BODY DEPTH. *Poultry Sci. 35(5):* 1126-1127. 1956.—The evaluation of turkey breast width measuurements obtained at the Massachusetts' random sample turkey test resulted in essentially the same relative rank of entries when breast width was taken at 1/3 or 1/4 of body depth as was obtained when breast width was measured at 1.5" or 1.75" of body depth.—*T. B. Kinney. (Biological Abstracts)*

KOMAREK, V. (Vet., U. Brno.) Prispevek k topografii dutiny telniu kura domáciho.

CONTRIBUTION TO THE TOPOGRAPHY OF THE BODY CAVITY IN DOMESTIC FOWL. *Sbornik Vysoké Zemed. Brno. B: Spisy. Fak. Vet. 3(3/4):* 257-268. 1955. (Biological Abstracts)

LAKE, P. E., and **WOOD-GUSH, D. G. M.** 1956. (Agric. Res. Coun. Poult. Res. Centre, Edinburgh.)

DIURNAL RHYTHMS IN SEMEN YIELDS AND MATING BE-

HAVIOUR IN THE DOMESTIC COCK. *Nature* [*Lond.*], *178:* 853.—Semen was collected by lumbar massage from 12 Brown Leghorn cocks at 08.30-09.30, 12.00-13.00 and 17.00-18.00 hrs. on 30th May, and on 4th and 9th June [1956]. The volume of semen yielded and the total absolute numbers of spermatozoa were greatest in the late afternoon. In both characters there were significant differences between cocks. During the hours of observation 19 matings were performed by 2 control cocks. Of these, 13 occurred between 17.00 and 18.00 hrs., indicating that mating activity is high when semen yields are at their best. (Animal Breeding Abstracts)

LEGAIT, H.

ETUDE HISTOPHYSIOLOGIQUE ET EXPERIMENTALE DU SYSTEM HYPOTHALAMO-NEUROHYPOPHYSAIRE DE LA POULE RHODE-ISLAND. *Arch. Anat. Microsc. Morphol. Exptl. 44(4):* 323-343. Illus. 1955.—The brain and hypophysis of Rhode Island Red hens was studied histologically at 18 periods in the annual cycle, including brooding, and after 42 varieties of experimental treatment. From all this it is concluded that the hormones prolactin, intermedin, and extracts of the posterior hypophysis all have an effect on broodiness. But simultaneous changes going on in the hypothalamus together with the accumulation of its neurosecretion in capillaries and in the infundibular recess at the beginning of brooding, suggest the source of stimulation of the hypophyseal secretion to be the neurohormones of the hypothalamus. The independent activity of the paraventricular and the supraoptic neurosecretory cells suggests that more than one neurohormone is involved.—*Hope Hibbard.* (Biological Abstracts)

LUBIS, D. A. (Central Animal Husbandry Experiment Station, Bogor, Indonesia) 1956

RELATION BETWEEN EGG-WEIGHT AND THE CALORIC VALUE OF THE EGG IN FOWLS AND THAT BETWEEN EGG-WEIGHT AND THE CORRESPONDING BABY-CHICKEN. *Hemera Zoa LXIII:* 485-494.—A study has been made of the relation between the egg-weight and the caloric value (gross energy value) of the egg and that between the egg-weight and the corresponding baby-chickens.

It is stated that the caloric value, as well as the weight of the chickens, is associated with the egg-size.

A decrease in one factor is attended with an increase in the other one.

Mathematical analysis of the statistics has led to the following regression equations: I: $Y = 215.327 - 0.983\ X$, in which X = egg-weight, and Y = caloric value.

II: $Y = 93.745 - 0.4417\ X$; here X = egg-weight, and Y = chicken weight expressed in percentage of egg-weight. (Author)

MIHAILESCU, N. and **A. PADURARU** 1955. Dezvoltarea puilor de rasa Rhode-Island de la ecloziune pina la virsta de 6 luni.

THE GROWTH OR RHODE ISLAND CHICKS FROM HATCHING TO SIX MONTHS OF AGE. *Anal. Inst. Cerc. zooteh., 13:* 387-397. [Russian and French summaries.]—Data were obtained from 37,135 Rhode Island Red chicks hatched in 1949-52 at various farms. Live weight at hatching averaged 38.03 g. The rate of growth was greatest in the first 2 mths., after which it gradually decreased. At 6 mths. av. live weight was 2119.0 for ♂♂ and 1639.0 g. for ♀♀. Chicks hatched in March-April had a higher live weight than chicks hatched in other months. Mortality was highest (7.5%) in the first month. Total mortality to 6 mths. averaged 18% (15-21); it was 10.13% for chicks hatched in March-April and 26-29% for those hatched in May-June.—Abstract of summaries. (Animal Breeding Abstracts)

MILCU, S. M., F. POPESCU, V. DERLOGEA, and **A. TACU** 1955. Cercetari experimentale asupra actiunii iodocaseinei la gainile locale Cenusii.

THE EFFECTS OF IODOCASEIN ON THE INDIGENOUS

GREY FOWL. *Anal. Inst. Cerc. zooteh., 13:* 693-706. [Russian and French summaries.]— For a year from 9 mths. of age 0.05 g. iodocasein was fed to 65 experimental hens on 3 consecutive days each week. Live weight was not affected. The egg production of the treated hens averaged 110.65 (63-181) *v.* 105.5 (47-200) for the untreated controls; av. egg weight was 1.11% greater in the experimental group. (Animal Breeding Abstracts)

MOULTRIE, FRED. (Agric. Expt. Sta. Alabama Poly. Inst., Auburn.)
A NEW TECHNIQUE FOR THE ARTIFICIAL INSEMINATION OF CAGED HENS. *Poultry Sci. 35(6):* 1230-1234. Illus. 1956.—A new technique for the artificial insemination of caged hens is described and illustrated. Experiments were conducted to determine efficiency of the new "in-cage" technique of insemination. At low and intermediate levels of fertility, the new technique resulted in higher fertility than did the old or standard method of insemination. At a high level of fertility, there was little difference between fertility obtained by the 2 methods. A time study of the 2 methods indicated that the new method was faster by about 40 birds per hour. A study of egg production for an 8-week period prior to and for an 8-week period during artificial inseminations indicated no adverse effects of the inseminations on egg production.—*F. Moultrie.* (Biological Abstracts)

NAKAJO, SEIICHI, and **KATUHIDE TANAKA.** (Fac. Agric., Nagoya U., Anzyo, Aiti-Ken, Japan.)
PROLACTIN POTENCY OF THE CEPHALIC AND THE CAUDAL LOBE OF ANTERIOR PITUITARY IN RELATION TO BROODINESS IN THE DOMESTIC FOWL. *Poultry Sci. 35(5):* 990-994. 1956. —Nagoya breed laying and broody hens and the hens which received electrical stimulations or lighting were used. Electrical stimulations were made on the head of the broody hen according to the method reported previously. Lighting was made from 12.00 noon to 8:00 A.M. of the next morning by 60 watt light-bulb at a distance of 70 cm. Fresh suspensions of the cephalic and the causal lobes of the anterior pituitaries were assayed for prolactin by the local pigeon crop gland response. In the laying hen the caudal lobe had less potency than the cepahlic lobe, but in the broody hen the two lobes had nearly the same potency especially in the early stage (3-7 days) of broodiness. If the hen received electrical stimulations or lighting the potency of the caudal lobe decreased to the level of the laying hen while the potency of the cephalic lobe was unaltered.—*S. Nakajo.* (Biological Abstracts)

PARKER, J. E. (Oregon Agric. Expt. Sta., Corvallis.)
RATE OF COMB GROWTH IN NEW HAMPSHIRE COCKERELS AS RELATED TO THEIR SUBSEQUENT REPRODUCTIVE PERFORMANCE IN FLOCK MATINGS. *Poultry Sci. 35(5):* 1030-1033. 1956.—Results from experiments over a 3-year-period with flock mated New Hampshires in which over 20,000 eggs were incubated show that comb size of cockerels at 16 weeks is related to age at which full fertilizing capacity is attained but is not related to their fertilizing capacity thereafter. Cockerels with fast comb growth fertilized over 90% of eggs from their mates at 20-23 weeks of age. Medium and slow comb growth males were approximately 2 and 4 weeks older before reaching full fertilizing capacity. From the time that the 3 groups of males attained 90% fertility no differences were observed during the rest of the year—the fertility percentages being 90.0, 90.4 and 90.9 for the flocks mated to the fast, medium and slow comb growth males respectively. Rate of comb growth of males had no effect on hatchability of eggs laid by their mates.—*J. E. Parker.* (Biological Abstracts)

PAYNE, LOYAL (Kansas State Coll., Manhattan, Kansas), and **LESLIE ORTMAN.**
EGG PRODUCTION PATTERNS IN TURKEYS. *Poultry Sci. 35(6):* 1201-1206. 1956.—Production of 33 Broad Breasted Bronze turkey females during 81 days in the spring of 1955 averaged 73.1%:

47% in the forenoon and 53% in the afternoon. Production was characterized by long clutches and short intervals between clutches. The hens frequently produced an egg every 24 hours and occasionally in 18-20 hours. The number of eggs in a clutch (eggs laid on successive days) ranged from 1 to 18. Most clutches began at 9:00 a.m., or before, and 76.5% of all clutches were begun in the forenoon. Clutches usually ended in mid-to-late afternoon. While eggs usually diminished in size as the clutch progressed, the decrease was less than that reported for chickens. —*Loyal Payne.* (Biological Abstracts)

POLIN, DONALD, JAMES L. GILFILLAN, WALTHER H. OTT, and **CURT C. PORTER.** (Merck Inst. Therap. Res., Rahway, N. J.)

4,4'—DINITROCARBANILIDE IN EGG YOLKS FROM HENS FED NICARBAZIN. *Poultry Sci. 35(6):* 1367-1371. 1956.—4,4-Dinitrocarbanilide (DNC), a moiety of the coccidiostratic drug nicarbazin, is found in yolks of eggs laid by hens that ingest nicarbazin. Yolk DNC content is linearly related to percent nicarbazin in the feed, up to .02%, when hens consumed nicarbazin feeds for 10 days or more. After a 3-4 day lag, following initiation of cessation of nicarbazin feedings, DNC concentrations in yolks change approximately linearly with time. About 10 days of nicarbazine feeding produces maximum DNC concentration in yolk, and after a similar length of time off the drug, the yolks of laid eggs become free of DNC.—*D. Polin.* (Biological Abstracts)

RUNGE, S. and **CHWOJNOWSKI, A.** Działanie stilboestrolu (Willestrolu) u kogutow i kur.

THE EFFECTS OF STILBOESTROL (WILLESTROL) ON COCKS AND HENS. *Rocz. Nauk. rol.* [*E*], *1955, 67,* 143-153. [Zakl. Zoohig., Wyzszej. Szkoly Rol. Poznan.] Russian andEnglishsummaries.

Sexually immature White Leghorn cocks and pullets, 2 to 4 months old, and mature birds 16 to 24 months old were given stilboestrol (Willestrol) for 3 to 5 months, intramuscularly, as 5 mg. every other day, or by implantation of two 15-mg. pellets every 14 days.

The hormone either way caused recession of secondary male and the appearance of some female characteristics in the young cocks. In older birds it caused deaths by avian leucosis, more numerous among females than males. The flesh of older hens given oestrogen was more juicy and tender than that of untreated birds of the same age. (From summary.)—*T. D. Bell.* (Nutrition Abstracts and Reviews)

SCHROEDER, W. A., and **LOIS M. KAY.** (Gates and Crellin Labs. Chem., Californ'a Inst. Technol., Pasadena 4.)

THE AMINO ACID COMPOSITION OF CERTAIN MORPHOLOGICALLY DISTINCT PARTS OF WHITE TURKEY FEATHERS, AND OF GOOSE FEATHER BARBS AND GOOSE DOWN. *Jour. Amer. Chem. Soc. 77-14):* 3901-3908. 1955.—Chromatographic analyses have established that differences exist in the amino acid composition of morphologically distinct parts of white turkey feathers. Furthermore, it is probable that different types of feathers from a given species of bird are identical in amino acid composition but that feathers from different species of birds are dissimilar. The high content of proline in feather proteins makes it unlikely that the polypeptide chains of these proteins assume simple pleated, sheet or helical configurations.—Auth. abst. (Biological Abstracts)

SPINKA, J. 1956. Vliv. pivovarskych kvasnic aktivovanych ultrafialovymi paprsky na pohlavni vyvoj mladych kohoutu.

THE EFFECT OF BREWER'S YEAST ACTIVATED BY ULTRA-VIOLET RAYS ON THE SEXUAL DEVELOPMENT IN COCKERELS. With the technical collaboration of J. Rentze and L. Murdychove. *Sborn. csl. Akad. Zemed. Ved. Zivoc. Vyr., 29:* 603-610. [Russian, English and German summaries.]—The diet of the experimental group of 10-wk. Leghorn cockerels contained 1 g. activited yeast and that of the control group 1 g. unactivated yeast. Live weight, comb growth, testis weight, the haemoglobin content of the blood and sperma-

togenesis were increased in the experimental cockerels. Possible effective factors in the yeast are considered.—Abstract of summaries (Animal Breeding Abstracts)

TAYLOR, LEWIS W., RAYMOND A. SJODIN, and **C. A. GUNNS.** (U. California, Berkeley.)
THE GASEOUS ENVIRONMENT OF THE CHICK EMBRYO IN RELATION TO ITS DEVELOPMENT AND HATCHABILITY. 1. EFFECT OF CARBON DIOXIDE AND OXYGEN LEVELS DURING THE FIRST FOUR DAYS OF INCUBATION UPON HATCHABILITY. *Poultry Sci. 35(6):* 1206-1215. Illus. 1956.—Normal hatchability resulted from CO_2 levels from approximately zero to 1.0%. At 1.1% or higher hatchability was significantly reduced in direct proportion to increase in CO_2 levels. No improvement over control incubator hatchabilities was obtained at any experimental level of CO_2 given. Reduction of exposure to CO_2 to the first 24 to 48 hours of incubation also failed to improve hatchability over control conditions. O_2 levels below 18% reduced hatchability proportionately to decrease in O_2 concentration. Normal hatchabilities were produced at levels from 18 to 50% O_2. At 75% O_2 or higer levels, hatchability was significantly reduced. Combined O_2 and CO_2 stresses acted additively when individual gas effects produced mild reductions in hatchability and in complementary fashion when both gases had severe effects. Commercial incubators tested had O_2 and CO_2 levels well within tolerance ranges of the early chick embryo, which is very susceptible to reduced O_2 supply or to high CO_2 concentrations and very resistant to high O_2 levels.—*L. W. Taylor.* (Biological Abstracts)

THORNTON, P. A., P. J. SCHAIBLE, and **L. F. WOLTERINK.** (Michigan State U. Expt. Sta., E. Lansing.)
INTESTINAL TRANSIT AND SKELETAL RETENTION OF RADIOACTIVE STRONTIUM^{90}-YTTRIUM^{90} IN THE CHICK. *Poultry Sci. 35(5):* 1055-1060. 1956.—The intestinal transit rate and net retention of Sr^{90}-Y^{90} was determined on 2-week old chicks given 2 different feeding regimes. The presence of 25% lactose in the diet did not alter intestinal transit of this isotope despite the presence of an extremely wet excreta. The transit rate was found to be a simple exponential function in both groups. Net retention of $Sr.^{90}$-Y^{90} by the skeleton was found to be highly correlated with the amount passed to the lower intestine but unrelated to the blood level, which was low at all times.—Auth. summ. (Biological Abstracts)

WILLIAMS, DAVID DEWAYNE. (U. Illinois, Urbana.)
A HISTOLOGICAL STUDY OF TEMPERATURE EFFECTS ON THE TESTIS OF THE FOWL. *Dissertation Absts. 15(11):* 2356-2357. 1955.—(Biological Abstracts)

WILSON, WILBOR O. (U. California, Davis), **ALLEN E. WOODARD,** and **HANS ABPLANALP.**
THE EFFECT AND AFTER-EFFECT OF VARIED EXPOSURE TO LIGHT ON CHICKEN DEVELOPMENT. *Biol. Bull.* 111(3): 415-422. 1956.—Continuous light improved body weight of all birds and testes size of males at 7 weeks, but impaired feather development. Continuous lighting delayed sexual maturity of pullets, and growth in both sexes was retarded until they reached 20 weeks of age. Under suboptimal light intensities, light exposure has no effect on body size after 12 weeks of age. Rate of sexual development was increased by larger daily exposure to light. These effects were more pronounced when treatments were applied to pullets over 90 days old than during earlier stages of development. Three light intensities were applied to growing birds: 0.0-0.4 foot-candles, 0.4-6.6 foot candles, and 0.5-30.0 foot-candles. Growth was not affected by lower light intensities but sexual maturity was delayed. Body weight was unaffected by lighting frequency. Sexual maturity, however, was significantly advanced when suboptimal light exposure and light intensities were applied in frequent

but small doses. Thus, it was found that 12 periods of 7.5 minutes of dim light per day produced a rate of sexual development almost equal to the rate with 14 hours per day of normal lighting. These results are taken as further proof that the after-effects of light on the reproductive mechanisms of chickens are considerable.—Authors. (Biological Abstracts)

WOOD-GUSH, D. G. M., and **R. OSBORNE** 1956. (Poult. Res. Centre, Edinburgh.)
A STUDY OF DIFFERENCES IN THE SEX DRIVE OF COCKERELS. *Brit. J. Anim. Behav., 4:* 102-110.—The mating frequencies of 30 [Brown Leghorn] cockerels were studied under uniform conditions. These ♂ ♂ belonged to 6 sire families and 15 full-sib pairs. It was found that there were significant differences between the sire families indicating that mating frequency has a genetic basis. When incompleted and completed matings were weighted, these genetic differences remained, and the use of a discriminatory analysis showed that the frequency of all types of mating was a satisfactory criterion of individual behaviour. During the course of mating frequency tests, monthly samples of semen were taken from the ♂ ♂. No correlation was found between the mating rank of a ♂ and the quality of his semen assessed on volume, density and sperm morphology. The 5 top ranking and 5 lowest ranking ♂ ♂ were tested for fertility and the top ranking ♂ ♂ gave the best results as a group. A significant negative correlation (—0.4972) was found to exist between comb index (= height/width) and mating frequency. Furthermore, there was a correlation of —0.5055 between mating frequency and the comb index calculated from the 15 dam-family averages of these variables and one of —0.6368 from the 6 sire family averages. Further analysis revealed the apparent absence of genetic variability in comb index, suggesting that the correlations were phenotypic only and indicating that the differences in mating activity could not be wholly explained on the basis of comb index. Finally, dubbing failed to improve the mating frequency of 2 low ranking cockerels to any great extent.—Authors' summary. (Animal Breeding Abstracts)

NUTRITION

ASSEM, MAHMOUD AHMED. (Kansas State Coll., Manhattan.)
EFFECT OF FEEDING VARIOUS LEVELS OF CHLORTETRACYCLINE DURING CONDITIONS OF NATURAL AND ARTIFICIAL STRESS UPON EGG PRODUCTION, EGG QUALITY, AND THE ANTIBIOTIC POTENCY IN EGGS AND MEAT. *Dissertation Absts. 16(7):* 1196. 1956. (Biological Abstracts)

BERG, LAWRENCE RAYMOND. (State Coll. Washington, Pullman.)
STUDIES ON UNIDENTIFIED GROWTH FACTORS FOR POULTRY. *Dissertation Absts. 15(12):* 2370-2371. 1955. (Biological Abstracts)

BERG, LAWRENCE R., C. M. HAMILTON, and **GORDON E. BEARSE.** (State Coll. Washington, Western Washington Expt. Sta., Puyallup.)
NITROFURAZONE AND NICARBAZIN AS GROWTH STIMULANTS AND COCCIDIOSTATIC AGENTS FOR YOUNG CHICKS. *Poultry Sci. 35(6)* 1394-1396. 1956.—With broiler chicks started on new wood shavings litter, the use of nicarbazin at a level of 0.0125% of the diet resulted in (1) no increase in rate of growth: (2) a decrease in feed efficiency; (3) freedom from coccidial infection; (4) development of immunity to *E. tenella;* and (5) lack of development of immunity

to *E. necatrix*. A level of 0.02% nicarbazin resulted in (1) a depression in rate of growth; (2) a further depression in feed efficiency; and (3) the items 3, 4 and 5 above. Nitrofurazone at levels of 0.0055, 0.0070 and 0.0083% (1) had no effect on rate of growth; (2) improved feed efficiency; (3) did not afford complete protection from coccidial infection; (4) permitted development of immunity to *E. tenella;* and (5) permitted the development of *E. necatrix* in over 50% of the birds.—*L. R. Berg.* (Biological Abstracts)

BOGDONOFF, PHILIP D., Jr. (U. Maryland, College Park.)
FACTORS CONCERNED WITH CALCIUM METABOLISM IN THE FOWL. *Dissertation Absts. 16(1):* 146. 1956. (Biological Abstracts)

BOULENAZ, A. Les antibiotiques dans l'alimentation animale.
ANTIBIOTICS IN THE ALIMENTATION OF DOMESTIC ANIMALS. *Rev. Romande Agric., Viticult. et Arboricult. 11(5):* 36-38. 1955.—Recent investigations on the role played by antibiotics, alone or combined with vitamin B_{12}, in the nutrition of chickens, fatting hens, suckling pigs and calves are summarized. The action of different antibiotics seems to consist in inhibiting the growth of pathogenic bacteria and in favoring on the other hand bacteria wanted for the development of young animals. In suckling pigs the best results were obtained with Aureomycin and terramycin, weight increases are chiefly due to higher consumption of food, in a lesser degree to a more efficacious utilization. The optimum dose is 10 g of the combination antibiotic-vitamin added to the complete ration. If the latter contains fish meal, effects of an addition of vitamin B_{12} are nil. For chickens 5-10 grains of the combination should be added to the complete feed. The chief result obtained is a pronounced growth acceleration, while later egg yields seem not to be improved. For calves an addition of the combination seems generally not to be recommended as far as Switzerland is concerned. It works only before ruminating has begun, particularly if scours appear.—*W. Bally* (Biological Abstracts)

BUMGARDNER, HARVEY LINDY. (U. Maryland, College Park)
STUDIES ON THE SERUM PROTEIN BOUND IODINE LEVELS AND SERUM CHOLESTEROL LEVELS OF THE CHICKEN. *Dissertation Absts. 16 (1):* 1956. (Biological Abstracts)

BUNNELL, R. H. (U. Connecticut, Storrs.)
THE DETERMINATION OF DIPHENYL-P-PHENYLENEDIAMINE (DPPD) IN FEEDS. *Poultry Sci. 35(4):* 960-961. 1956.—A method for determination of diphenyl-p-phenylenediamine (DPPD) in feeds is presented. An adequate sample is first extracted with acetone, and aliquot saponified, and the DPPD extracted with benzene. The benzene DPPD solution is evaporated to dryness under nitrogen and taken up in conc. HNO_3. The red color is read in a colorimeter at 490.—*L. D. Matterson.* (Biological Abstracts)

COOPER, D. M. and **G. SKULSKI.**
EFFECTS OF FEEDING FURAZOLIDONE TO FOWLS. 1. EFFECT ON BODY WEIGHT AND SEXUAL DEVELOPMENT IN COCKERELS.

COOPER, D. M.
2. EFFECT ON EGG PRODUCTION, FERTILITY AND HATCHABILITY OF LOW LEVEL FEEDING TO PULLETS. *J. Comp. Pathol., 1956, 66:* 299-311; 312-316. (Houghton Poultry Res. Stat., Hunts)—1.Furazolidone given as 0.005, 0.01, 0.015 and 0.02 per cent. of the starter ration had no effect on the liveweight gains of day-old chickens in a trial lasting 12 weeks. In a similar trial, with cockerels, the different levels of furazolidone were continued to 12, 18 and 24 weeks. No effect was found on weight of combs or wattles, but after 12 weeks weight of testes was reduced by 0.02 per cent of the drug, and in longer periods

by 0.015 per cent also. When treatment with furazolidone was not begun till the birds were 6 weeks old, and was continued for 12 weeks, combs, wattles and testes were not significantly affected at the end of treatment or 6 or 12 weeks after it was discontinued.

Mature cockerels were given 0.04 or 0.08 per cent furazolidone for 21 days. Weight of testes was reduced by both levels, and of combs and wattles by 0.08 per cent. Four weeks after the drug had been stopped weight of testes was no longer significantly reduced, and combs and wattles of the birds getting the lower level of furazolidone had returned to normal. Those of the birds on the higher level were still significantly lighter than those of controls, but there was evidence that they were returning to normal size.

In immature cockerels 5 weeks old, 0.4-0.6 and 0.8 per cent furazolidone in the ration for 14 days reduced liveweight gains and feed intake. Weight of testes was also reduced, and weight of combs and wattles by the 2 highest levels. Four weeks after the treatment was discontinued the sexual changes had regressed, but liveweights of birds getting 0.6 and 0.8 per cent furazolidone were still inferior.

Histological study showed retarded spermatogenesis and atropy of the seminiferous tubules. The changes were more marked when higher levels of furazolidone were given, and 4 weeks after the treatment had been discontinued there were signs of recovery.

2. Furazolidone at 0.01, 0.15 and 0.02 per cent was included in the breeder mash of pullets from 14 to 26 weeks of age. Liveweight gain and feed consumption were not affected. Egg production started at 19 weeks of age, and was recorded for 24 weeks. It was not affected by furazolidone. The pullets were inseminated with semen from untreated cocks. Fertility and hatchability, recorded for 13 weeks, were not affected.—*T. D. Bell.* (Nutrition Abstracts Reviews)

COOPER, G. H.

THE VALUE OF FRESHWATER FISH AS THE PROTEIN SUPPLEMENT IN FEEDING LAYING HENS IN SOUTHERN RHODESIA. *Rhodesia Agric. J.*, 1956, *53:* 546-550.—Six pens each of 30 pullets were used in a laying trial lasting 13 months. All pullets were fed on mash and grain. For 2 pens a standard dry laying mash was used. The mash in 2 of the other pens contained 60 or 50 percent raw freshwater fish (*Tilapia* spp.) and 40 or 50 per cent white maizemeal, and in the remaining 2 similar mashes were given but with the fish boiled. The last 4 mashes were given wet.

Egg production was similar on the raw fish and the standard mashes, and slightly less on the boiled fish. Size of eggs and mortality were not affected, and the fish did not cause any unpleasant flavour in the eggs. The protein of the fish mashes was used almost twice as efficiently for egg production as that of the standard mash.—*T. D. Bell.* (Nutrition Abstracts and Reviews)

COWLISHAW, S. J. and **D. E. EYLES.**

THE VALUE OF LEAF-PROTEIN CONCENTRATES FOR GROWING AND LAYING PULLETS. *Empire J. Exp. Agric., 1956, 24:* 223-234. [Grassland Res. Inst., Hurley, Berks.]—The results of 4 trials showed that the value of leaf-protein concentrate varied from one sample to another. In one trial growth of pullets from 12 to 28 weeks of age was equally good on comparable levels of fishmeal or lucerne concentrate. In another trial the concentrate was from a mixture of lucerne and grass, and growth to 10 weeks old was less than on fishmeal. Half the birds were reared on a basal cereal mixture and leaf protein to this age and the other half on the basal mixture and fishmeal. From 10 to 20 weeks the birds were divided into 6 groups, getting leaf protein, fishmeal or groundnut meal. Growth on the leaf protein was not as good as on the other protein supplements, but the growth of those getting leaf protein for the first 10 weeks and fishmeal for the rest of the time was most rapid. In both these trials egg production was inferior on leaf protein, and date of first egg was retarded.

Birds in the second trial were studied from 20 to 30 and from 30 to

60 weeks old. In both these periods leaf protein was inferior for egg production. The effect of giving it from birth to 10 weeks old on liveweight and egg production was no longer apparent in birds which had changed to fish- or groundnut meal.

The last trial compared a basal ration with only 8 per cent crude protein and the same with supplements of leaf protein concentrate, supplying 3 or 5 per cent crude protein, fishmeal supplying 3 or 5 per cent crude protein or groundnut meal supplying 5 or 7 per cent. One group got a basal ration with 10 per cent crude protein and leaf protein concentrate giving 3 per cent. All gave significantly greater egg production than the control ration and did not differ from each other.

Egg quality was not adversely affected by the use of leaf protein, but all eggs had darker yolks; the darker colour disappeared about 9 eggs after leaf protein was stopped, independently of the time.—*T. D. Bell.* (Nutrition Abstracts and Reviews)

CREEK, RICHARD DAVID. (Purdue Univ., Lafayette, Ind.)
MANGANESE IN CHICKEN NUTRITION. *Dissertation Absts. 15(12):* 2371. 1955. (Biological Abstracts)

DONALDSON, W. E., G. F. COMBS, and **G. L. ROMOSER.** (U. Maryland, College Park.)
STUDIES ON ENERGY LEVELS IN POULTRY RATIONS. 1. THE EFFECT OF CALORIE-PROTEIN RATIO OF THE RATION ON GROWTH, NUTRIENT UTILIZATION AND BODY COMPOSITION OF CHICKS. *Poultry Sci. 35(5)* 1100-1105. 1956.—In experiments with chicks reared to 4 weeks of age, the productive energy level of the ration was found to influence the protein level required in the ration as meausred by growth rate, feed consumption and body composition. As the ratio of energy to protein in the ration was widened, the energy intake and carcass fat deposition were increased and the water content of the carcass was decreased. Impaired feed conversion and growth also resulted when the ratio of calories of productive energy per pound for each 1% protein exceeded 43.9, 48.6, and 53.7 on the low, medium and high fat diets, respectively. At any protein level, a wider ratio of productive energy to protein in the ration was tolerated, without adversely affecting growth rate, as the proportion of calories from dietary fat to those from other sources was increased. As the energy-protein ratio of the ration was increased, less dietary protein and more dietary energy were required per unit of grain.—*G. F. Combs.* (Biological Abstracts)

EATON, RICHARD CHANNON. (U. Illinois, Urbana.)
EFFECTS OF CERTAIN STEROID HORMONES ON GROWTH AND FEED EFFICIENCY IN CHICKENS. *Dissertation Absts. 16(9):* 1547. 1956. (Biological Abstracts)

FANGAUF, R., F. W. KLEIN and **G. V. BARLÖWEN.** Putenaufzuchtversuch mit verschiedenen Futtermischungen.
REARING TURKEYS ON DIFFERENT RATIONS. *Arch. Geflügelk., 1956, 20:* 435-443. [Lehr.- u. Versuchsanst. Kleintierzucht, Kiel-Steenbek.] English summary.—Two poult starter rations, based on American standards but of home feedingstuffs, were made up as follows: (1) ground maize 25, ground wheat 25, cod fish meal 20, wheat bran 8, Maizena 6, alfalfa meal 5, soya extraction meal 4.5, fodder yeast 4, minerals and a vitamin mixture giving vitamin A 6000 I.U., vitamin $D_3$600 I.U. and riboflavin 2 mg. per kg. ration (26 per cent. crude protein); (2) a commercial protein concentrate 30, ground maize 20, ground wheat 20, ground oats 10, wheat bran 8, Maizena 5, alfalfa meal 2.5, fodder yeast 2 per cent, with minerals and vitamins as above (24 per cent crude protein); the protein concentrate consisted of fishmeal 25, cod fish meal 20, soya extraction meal 20, meat-and-bone meal 9, groundnut extraction meal 6, alfalfa meal 5, coarse bonemeal 5, dried milk 4, fodder yeast 4, blood meal 2 per cent. With these were compared a standard commercial all-mash chick ration (16 per cent protein), an all-mash fattening ration (20 per cent protein) and a com-

mercial pig root-balancer meal (24 per cent protein), all of which contained an antibiotic; details of composition are given. The 5 groups each of 22 Bronze day-old turkey poults had the dry meals always available; twice a day some was given moist. No green feed was given. Grit, shell and water were always available. Weight and feed consumption were ascertained fortnightly.

The mean weights at 8 weeks were 1327, 1298, 953, 1129 and 1114 g. The chick ration was manifestly unsuitable. The pig meal nearly equalled the poult starters for feeding efficiency but not for feathering or uniformity of growth. The satisfactory results with the poult starters could doubtless be improved by adding an antibiotic, and it would be desirable to have such a ration commercially available. It should include at least 25 per cent crude protein (at alest 15 per cent animal protein), not more than 7 per cent crude fibre (at least 50 per cent ground cereals), and minerals 2 per cent; and, per kg., vitamin A 6000 I.U., vitamin D_3 800 I.U., riboflavin 4 mg., and aureomycin or terramycin 10 mg. or penicillin 5 mg. This ration would, it is suggested, also be suitable for rearing pheasant and guineafowl chicks.—*W. M. Deans.* (Nutrition Abstracts and Reviews)

FANGAUF, R., F. W. KLEIN and **G. V. BARLÖWEN.** Unterschiedliche Fütterungstechnik in der Junghühnermast unter besonder Berücksichtigung von Milchprodukten.

DIFFERENT METHODS OF FATTENING CHICKENS, WITH SPECIAL REFERENCE TO MILK PRODUCTS. *Arch. Geflügelk., 1956, 20:* 393-404.—[Lehr. -u. Versuchsanst. Kleintierzucht, Kiel-Steenbek.] English summary.—In the spring of 1956 New Hampshire chicks of both sexes were fed for the first 2 weeks on a basal ration, given dry, of ground maize 33, ground wheat 33, wheat bran 18, cod fish meal 6, soya extracted meal 6, dried yeast 3 and DLG mineral mixture Ia 1 per cent, with vitamin A 4000 and vitamin D_3 400 I.U. per kg. diet. Twelve groups of 30 were then formed and after 6 weeks 10 cockerels were taken from each group for 2 weeks' finishing. The rations were: (1) basal throughout; (2) fishmeal reduced to 3, dried skimmed milk 5, less grain; (3) no fishmeal, dried skimmed milk 10; (4) ration 1 for 6 weeks, then ration 3; (5) ration 2 for 6 weeks, then ration 3; (6) as (4), but ration 3 given moist; (7) as (5), but ration 3 given moist; (8) basal for 6 weeks, then a 1 : 1 mixture of ground maize and ground wheat moistened with skimmed milk; (9) fishmeal reduced to 3, dried whey 20, given dry; (10) as (9), but moist for the last 2 weeks; (11) and (12), 2 different commercial pelleted rations containing antibiotics (stated composition given), dry. Grit, shell and water were always available.

As usual, it was found that moistening or pelleting increased the amount of feed taken. The respective mean weights at 8 weeks were 617, 650, 529, 609, 654, 603, 626, 625, 580, 556, 742, 748 g. and at 10 weeks 1180, 1160, 940, 1040, 1078, 1150, 1111, 1230, 850, 980, 1380, 1244. Thus no ration was as good as the commercial pellets; the best was (8), with fresh skimmed milk. Omission of fishmeal (3) or use of dried whey (9 and 10) gave very poor results. The commercial pellets also gave the best feeding efficiency during the main period, though good results in the final period were found also in groups 2 and 6. Group 2 gave the best carcases; those of group 8 were too fat next came those fed on pellets. Those given dried whey in a wet mash were also good. Carcases from the other groups were only second grade. From these findings and a study of costs it was concluded that milk no longer holds the place it did in chicken feeding; vitamins can be supplied in other ways, and as source of protein milk and dried milk are too dear for general use. Whey is not recommended as part of a broiler ration. Wet mashes mean too much work for regular use on a large scale; they can be given occasionally as a change or towards the end of the fattening period.—*W. M. Deans.* (Nutrition Abstracts and Reviews)

FERGUSON, T. M., H. P. VAUGHT, L. D. MATTERSON, B. L. REID, and **J. R. COUCH.** (Texas A. and M. Coll., College Station.)

GROWTH OF BROAD BREASTED BRONZE TURKEY POULTS FED A 26 PERCENT PROTEIN DIET WITH DIFFERENT

LEVELS OF PRODUCTIVE ENERGY. *Poultry Sci. 35(6):* 1305-1308. 1956.—Six groups of 50 female and 6 groups of 45 male Broad Breasted Bronze turkeys were fed a 26% protein diet containing calculated productive energy levels of 670, 739, 797, 739, 802 and 865 calories per pound, respectively. A duplicate experiment with 6 groups of females was initiated 2 weeks later. The best growth at 8 weeks was obtained with males and females fed a diet containing a calorie-protein ratio of approximately 29:1.—*T. M. Ferguson.* (Biological Abstracts)

FRANCIS, DAVID WESSON. (U. Maryland, College Park.)
AN INVESTIGATION OF THE MORPHOLOGICAL CHANGES IN YOUNG CHICKENS AND REPRODUCTIVE PERFORMANCE OF ADULT CHICKENS FED FURAZOLIDONE OR NITROFURAZONE. *Dissertations Absts. 15(11):* 1955-1956. 1955. (Biological Abstracts)

FRANCIS, D. W., and C. S. SHAFFNER. (U. Maryland, College Park.)
AN INVESTIGATION OF THE MORPHOLOGICAL CHANGES IN YOUNG CHICKENS AND THE REPRODUCTIVE PERFORMANCE OF ADULT CHICKENS FED FURAZOLIDONE OR NITROFURAZONE. *Poultry Sci. 35(6):* 1371-1381. 1956.—Studies were conducted using levels of 0.0055 to 0.022% furazolidone or nitrofurazone to further evaluate the safety of these compounds for chickens. These drugs were mixed in a practical ration and fed to day-old chicks for 4 weeks; to 5 week-old chicks for 3 weeks; and to laying pullets for 16 weeks. In chicks, gains in weight and weights of various organs and glands were recorded and compared. Egg production, hatchability of all eggs set, and shell quality were obtained for laying pullets. The drugs produced small differences in most glands which in most cases were not significant; however, thyroid gland size appeared to be most consistently decreased. Body weight was significantly reduced when either 0.0165 or 0.022% nitrofurazone was fed. Feeding of the nitrofurans did not change effect of thiouracil on body weight or thyroid size. These drugs, when fed to laying pullets, had little or no effect upon total production, hatchability of all eggs set, or shell quality.—Auth. summ. (Biological Abstracts)

GRIMINGER, PAUL. (U. Illinois, Urbana.)
EFFECTS OF CERTAIN FACTORS ON THE AMINO ACID REQUIREMENTS OF THE CHICK. *Dissertation Absts. 16(2):* 198-199. 1955. (Biological Abstracts)

HANACEK, S., N. MASEK, J. TYLECEK (Agricultural University, Brno, Czechosolovakia Vysledky pokusu se zkmovanim kukel bource morusoveho jatecnym kohoutkum.
RESULTS OF AN EXPERIMENTAL FEEDING OF COCKERELS WITH MULBERRY WORMS. *Sbornik CAZV, zivocisna vyroba 30:* 51-68.—Experimental feeding of cockerels with mulberry worms. The ration of the experimental group contained 11.36 g. daily of two-years old mulberry worm pupae, that contained 46.58 per cent of protein and 95.7 per cent of digestible food elements. Cockerels ate the worms and pupae with zest. After 34 days the weight of experimental chickens increased by 13.3%. The output of cockerels of the control group amounted to 71.77 per cent and of cockerels in the experimental group 73.39 per cent. (Orel)

HEYWANG, BURT W. (U. S. Dept. Agric., Agric. Res. Serv., Glendale, Arizona.)
THE EFFECT OF HIGH LEVELS OF ANTIBIOTIC ON LAYING CHICKENS DURING HOT WEATHER. *Poultry Sci. 35(6):* 1196-1200. 1956.—In experiments during hot weather White Leghorn pullets were fed an all mash diet supplemented with crystalline chlortetracyline hydrochloride at the level of 0, 50, or 100 g/ton. Two of the experiments were in progress during cool weather. Both the 50 and 100 g level of antibiotic increased egg production during hot weather and the

available data indicate the same trend during cool weather. Increase in egg production was greater among the poor layers than among good layers. The supplement decreased the feed consumed per dozen eggs, but had little, if any effect on hatchability of fertile eggs, maintenance of live weight or mortality.—*C. A. Denton.* (Biological Abstracts)

HOHLS, H. W. (Bundesforschungsanst. Kleintierzucht, Celle.) Die wachstumsfördernde Wirkung des Penicillins bei der Kükenaufzucht.

THE GROWTH-PROMOTING ACTION OF PENICILLIN IN CHICKS. *Arch. Geflügelk., 18:* 304-326, 1954.—By means of 35 lots the effect of Penicillin on the growth of White-Leghorn pullets is studied.

Penicillin has an effect on the quantity of digested food. This is one reason for the different responses of antibiotic supplementations. Moreover, a supplementation of penicillin has an effect on the intermediary metabolism. It enlarges the amount of biological value of protein. (English Summary)

HUNT, JOHN ROBERT. (State Coll. Washington, Pullman.)

STUDIES ON THE PREVENTION OF A PEROSIS-LIKE CONDITION IN TURKEYS INDUCED BY AN ISOLATED SOYBEAN PROTEIN. *Dissertation Absts. 16(3):* 423. 1956. (Biological Abstracts)

IMABAYASHI, KEN-ICHI, MASAO KAMETAKA, and **TADASHI HATANO.**

STUDIES ON THE DIGESTION IN THE DOMESTIC FOWL. I. "ARTIFICIAL ANUS OPERATION" FOR THE DOMESTIC FOWL AND THE PASSAGE OF THE INDICATOR THROUGH THE DIGESTIVE TRACT. *Tohoku Jour. Agric. Res. 6(2):* 99-117. 1955.—To collect the feces of domestic fowl separate from the urine, several birds were surgically provided with an opening from the rectum above the cloaca. The birds appeared normal a few days later, but died suddenly in about 3 weeks. Radioactive barium was given to the birds at the middle of several feedings both before and after the operation. Under both conditions, radioactivity in the feces very high about 3-4 hours after feeding, and persisted for as long as 48 hours.—*H. F. Copeland.* (Biological Abstracts)

KLAIN, G. J., D. C. HILL, H. D. BRANION, and **JEAN A. GRAY.** (Ontario Agric. Coll., Guelph, Ontario, Canada.)

THE VALUE OF RAPESEED OIL MEAL AND SUNFLOWER SEED OIL MEAL IN CHICK STARTER RATIONS. *Poultry Sci. 35(6):* 1315-1326. 1956.—Chemical and microbiological analysis showed that in comparison with commercial soybean oil meal (solvent processed) commercial rapeseed oil meal and sunflower seed oil meal (both expeller processed) were high in fiber, niacin and chlorine and low in lysine and moderately low in phenylalanine and tyrosine. In addition rapeseed oil was moderately low in arginine. As increasing amounts of either Argentine or Polish variety rapeseed meal replaced soybean oil meal in chick rations progressively poorer growth resulted. When supplemental lysine was provided, growth was improved. A level of 0.4% L-lysine was adequate to supplement a ration in which all soybean oil meal was replaced with Argentine rapeseed oil meal. Supplementation with several other amino acids in addition to lysine did not further improve growth. A goitrogenic principle was present either in higher concentration or in more active form in Argentine meal than in Polish meal. Neither iodinated casein nor potassium iodide, when added to the rapeseed oil meal rations, affected the growth of the birds significantly. However, iodinated casein greatly reduced thyroid gland weight whereas potassium iodide failed to do so. Supplementation of a rapeseed oil meal ration with a mixture of 13 vitamins neither affected growth of the birds nor weight of their thyroid glands. A complete replacement of soybean oil meal with sunflower seed oil meal markedly decreased growth. Supplementation of this ration with lysine improved growth considerably but did not quite restore growth to that given by the soybean oil meal ration. Lysine appeared to be the main, if not the only, amino acid limiting growth of chicks fed rations containing high levels of sunflower seed oil meal.—*D. C. Hill.* (Bological Abstracts)

KLEIN, F. W. and **G. v. BARLÖWEN.** (Lehranst. Kleintierzucht, Kiel, Steenbek.) Tapioka-Mehl im Aufzuchtfutter.

TAPIOCA MEAL IN THE REARING RATION. *Arch. Geflügelk., 18: 415-428,* 1954.—An experiment has been made to study the influence of tapioca (Manihot utilissima)—meal for baby chicks. An allmash feed for baby chicks should contain not more than 10 percent of tapioca-meal in order to get best growth results. It is not possible to replace the ground grain by tapioca-meal. The tapioca-meal contains a factor which decreases the feed consumption. (English Summary)

LOWE, I. P. and **E. ROBERTS.** (Wernse Lab. Cancer Res., Sch. Med., Washington Univ., St. Louis, Mo.)

INCORPORATION OF RADIOACTIVE SULFATE SULFUR INTO TAURINE AND OTHER SUBSTANCES IN THE CHICK EMBRYO. *J. Biol. Chem., 212:* 477-483, 1955.

1. Injection of S^{35}-labeled sulfate into chick embryos resulted in a rapid fixation of the sulfate sulfur into taurine and a number of unidentified substances, but not into cystine, methionine, or glutathione. The activities in taurine and two of the unknown substances were determined at several time intervals between 30 minutes and 24 hours after administration of the isotope.

2. Radioactivity appeared in several substances, but not in taurine, when a homogenate of chick embryo was incubated with S^{35}-sulfate in the presence of pyruvate and acetate. The addition of coenzyme A, ATP, and DPN significantly increased the amount of radioactivity appearing in the major radioactive area on two-dimensional chromatograms. (Authors)

MACHLIN, L. J., P. B. PEARSON and **C. A. DENTON.** (Animal and Poultry Husb., U.S. Dept. Agric., Beltsville, Md.)

THE UTILIZATION OF SULFATE SULFUR FOR THE SYNTHESIS OF TAURINE IN THE DEVELOPING CHICK EMBRYO. *J. Biol. Chem. 212:* 469-475, 1955.

1. The uptake and distribution of S^{35} were determined in the developing chick embryo after injection of S^{35}-labeled sulfate into the egg.

2. Almost all of the S^{35} administered was recovered in the day-old chick. About 65 per cent of the dose occurred as organic sulfur in the protein-free filtrate. The remainder was present as sulfate, primarily in the protein fraction.

3. The organic material containing S^{35} was identified as taurine. No radioactive cystine, methionine, or cysteic acid was detected.

4. A total of about 50 mg of taurine per egg was synthesized during the course of incubation. Taurocholic acid accounted for only a small portion of the total taurine. (Authors)

MANTEL, L. (Geflügelzuchtlehranst. Erding, Obb.) Einfluss von verschieden hohem Getreideanteil im Mischfutter auf Legeleistung, Zuchterfolg und Wirtschaftlichkeit der Fütterung.

EFFECT OF DIFFERENT AMOUNTS OF GRAIN IN A LAYING MASH ON EGG YIELD, BREEDING RESULTS AND ECONOMICS OF FEEDING. *Arch. Geflügelk. 18:* 428-437, 1954.—An experiment has been carried out to study effect of various levels of grain in a laying mash. 240 birds were divided into 4 groups and received daily 50 gms of grain per bird and laying mash ad libitum for 350 days. The levels of groundgrain in the laying mash of the four groups were as follows: group I 0%, group II 15%, group III 30%, group IV 50%. The birds of group I which received no grain showed the lowest egg production. The birds of group I laid 170.5 eggs in comparison to the birds of group II with 184.4, group III with 201, and group IV with 219.5 eggs per bird. The feed efficiency improved with increasing levels of ground grain (282, 261, 246, 222). The egg production during the winter months showed the same tendency (54.9, 60.5, 63.3, and 73.5) as well as the egg weight. The feed costs per 100 gms of produced eggs were in group I 20.0 Pf., in group II 18.8 Pf., in group III 19.0 Pf., and in group IV 16.8 Pf. 47% of the birds of group I, 50% of the birds of

group II, 62% of the birds of group III, and 78% of the birds of group IV laid more than 175 eggs with at least 55 gms. From the economic and breeding standpoint it is recommended to produce a laying mash containing 50% of ground grain. (English Summary)

MORRISON, A. B., R. DAM, L. C. NORRIS and **M. L. SCOTT.** (Cornell Univ., Ithaca, N. Y.)
FURTHER EVIDENCE ON THE REQUIREMENT OF THE CHICK FOR UNIDENTIFIED MINERALS. *J. Nutr. 60:* 283-295, 1956.—In further work on unidentified chick growth factors results were obtained which indicated that the basal diets supplied the chicks were adequate in amino acids, known vitamins and minerals, previously reported to be needed by animals. No evidence of an imbalance was obtained in the studies on required minerals. As a consequence it has been found, in confirmation of previous reports by this laboratory, that when a mixture of unidentified growth factor supplements is fed to chicks the growth response which is observed is due to the presence in the materials of both unidentified organic and inorganic constituents. The results of the investigation showed, therefore, that a mineral or minerals not hitherto considered to be essential in the nutrition of the chick is present in the mineral portion or ash of certain crude feedstuffs. The unidentified mineral(s) was found to be involved in bone formation. Evidence was also obtained which indicated that the unknown mineral nutrient(s) is present in the boiling water-insoluble fraction of the ash of the mixture of unidentified factor supplements, and that it is cationic in acid solution. No consistent effect of the ash on the intestinal microflora of the chicks or the pH of the intestinal contents was observed. (Authors)

MUELLER, WERNER J. (Pennsylvania State U., University Park.)
THE INFLUENCE OF ENERGY SOURCE, ENERGY-FIBER CONCENTRATION AND PROTEIN SOURCE OF THE DIET ON CERTAIN EGG QUALITY CHARACTERISTICS. *Poultry Sci. 35(5):* 1074-1078. 1956.—The influence of 4 diets, representing two energy concentrations (corn versus barley and oats) and two protein sources (meat scrap versus soybean oil meal), on egg quality was investigated. Eggs produced on the two diets containing meat scrap were significantly heavier than eggs produced on the two diets containing soybean oil meal. Neither shell thickness nor water loss of eggs during storage was influenced by the kind of diet fed. When albumen quality of broken-out eggs was measured by Haugh unit scores, differences among eggs from corn-soybean oil meal, corn-meat scrap, and barley-oats-soybean oil meal diets were insignificant. Eggs from the barley-oats-meat scrap diet, on the other hand, received significantly higher Haugh unit scores than eggs from any of the three other diets. However, when albumen quality was judged by candling, eggs from the two barley-oats diets were graded higher than eggs from the two corn diets. This is attributed to yolk color, since eggs from the two corn diets had darker yolks than eggs from the two barley-oats diets.—*W. J. Mueller.* Biological Abstracts)

OLSSON, N. Försök med flingor tillverkade av höns- och kycklingfoder.
EXPERIMENTS WITH PELLETS MADE FROM RATIONS FOR HENS AND CHICKS. *Kgl. Lantbrukshögsk. Statens Husdjursförsök Särtryck* No. 119, 1956, pp. 12.—The rations were of the usual sort, of cereals, oilseeds, fishmeal, meatmeal, lucerne meal, vitamins and minerals, heated and compressed or worked without pressure to pellets of diameter up to 3 mm. or more, according to the birds to be fed. In the first experiment with 150 White Leghorn chicks, those given pellets grew better, for less feed and with less mortality, than those given meal. In the second, third and fourth experiments with 400 chicks in groups of 25 there was no difference between those fed on pellets and those on meal, but in the fifth pellets again gave better results. Similar experiments with 3 groups of laying hens gave a percentage production, standarised to an egg weight of 57 g., of 64.1 for meal, 66.6 for pellets

of the same meal, and 69.5 for pellets of a different meal mixture. In general, pelleted rations saved about 10 per cent. of feed.—*I. Leitch.* (Nutrition Abstracts and Reviews)

PETERSEN, C. F. and **C. E. LAMPMAN.**
AUSTRIAN PEAS. A PROTEIN SUPPLEMENT IN POULTRY RATIONS. *Idaho Agric. Exp. Stat. Bull.* No. 231, April 1955, pp. 15.—A number of trials with chicks and laying pullets on the effect of replacing maize with Austrian peas *(Pisum arvense)* are reported.

It was first shown, using a semi-purified ration, that the peas, which contained 25 per cent protein, were deficient in methionine and when methionine was added as 0.25 per cent of the ration growth and efficiency were improved.

Neither wheat nor peas replacing 30 per cent., nor peas replacing 10 or 20 per cent., maize in the control ration gave as good growth to 4 weeks or efficiency as the control. When 0.1 per cent. methionine was added to the ration with 30 per cent. peas, growth was only 90 per cent. that of controls, but added to the ration with 20 per cent. peas it gave as good growth as in controls.

Antibiotics and 0.05 per cent. methionine with 20 per cent. peas gave as good growth as a control ration with 30 per cent. maize, though not as good as the control ration with antibiotics. Ten per cent. wheat and 20 per cent. peas, replacing all the maize, with 0.05 per cent. methionine and antibiotics, was also as good as the control ration. Twice as much methionine with similar replacements for maize was as good as the control with anitbiotics.

When the ration was crumbled (pelleted and then broken up) growth was better than on comparable rations given as a mash.

All the foregoing trials were from day-old to 4 or 8 weeks. A practical trial in which 20 per cent. peas and 0.1 per cent. methionine replaced soya bean oilmeal and maize confirmed that the peas could be used successfully for growth to 28 weeks.

In laying mashes 20 per cent. peas and 0.05 per cent. methionine gave as good egg production, egg size, hatchability and viability of chicks as the control ration with 30 per cent. maize. The chicks continued to receive rations containing peas or maize in the same proportions as their dams, and all grew equally well. Some of the hens on each ration had been reared from day-old on peas or maize, but this had no effect on performance or performance of their chickens.

A trial to show whether methionine was necessary or not in the laying mash was inconclusive because of excessive mortality due to recurrent intestinal coccidiosis.—*T. D. Bell.* (Nutrition Abstracts and Reviews)

PODHRADSKY, J. (Agricultural University, Brno, Czechoslovakia) Zjistovani krmne hodnoty keratinu.
(DETERMINATION OF FOOD VALUE OF KERATINE) *Sborník CAZV, zivocisna vyroba 30:31-50.*—Experimental feeding of poultry with hydrolysed feather. Hens receiving 20 and 40 g. of the feather meal decreased the egg production by 11%, whereas the egg weight was not influenced. The body weight of experimentally fed hens increased by 6.7 and 8.4 per cent. 30 per cent of the ration was replaced by the feather meal. The final live weight of the chicken was found to be 3 per cent lower in the group of experimental chickens. No statistical proof was made. (Orel)

POPESCU, Fr., and **St. FLORESCU.** 1955. Modificari spermatogenezice la cocosi sub actiunea alimentatiei cu porumb normal, mucegait, acidulat si sterilzat.
THE EFFECTS ON SPERMATOGENESIS IN THE COCK OF FEEDING NORMAL, MOULDY, ACIDIFIED OR STERILISED MAIZE. *Anal. Inst. Cerc. zooteh., 13:* 345-366.. [Russian and French summaries.]—The effects of feeding mouldy, acidified or sterilised maize to 12- to 20-mth. Rhode Island Red cocks were compared with those of feeding normal maize. In cocks on the experimental diets, ejacu-

late volume, the total number of spermatozoa, spermatozoal concentration, and spermatozoal motility were reduced; progressive spermatozoal motility was inhibited and up to 90% of the spermatozoa were abnormal. Libido decreased. Acidified maize affected spermatogensis to a greater degree than did the mouldy or sterilised maize. Results are tabulated and presented graphically.—*Abstract of summaries.* (Animal Breeding Abstracts)

LATORRE, LUIS. Experiencias Sobre Eficiencia De Harinas De Alfalfa En La Alimentacion Avicola.
EXPERIMENTS ON EFFICIENCY OF ALFALFA MEALS AS FOOD FOR CHICKENS. *Arch. Zootecnia 5(19):* 214-216. 1956.—Four different lots of alfalfa meals were analyzed with particular attention to carotene and vitamin A contents. Results are listed.—*D. F. Watson.* (Biological Abstracts)

LAUGHLAND, D. H., and **W. E. J. PHILLIPS.** (Chem. Div., Canada Dept. Agric., Ottawa.)
THE EFFECT OF DIETARY SODIUM BENTONITE ON THE RATE GROWTH OF CHICKS. *Poultry Sci. 35(5):* 1050-1054. 1956.—The incorporation of sodium bentonite in the diet of chicks limited their ability to store vitamin A in the liver. This effect was observed on a practical-type diet and on a vitamin A-deficient diet which was supplemented with either the preformed vitamin or with β-carotene in the form of dehydrated cereal grass. The increase in weight of various liver fractions evoked by vitamin A was prevented by the presence of sodium bentonite in the diet. Sodium bentonite limited the growth of chicks fed a vitamin A-deficient basal diet to which vitamin A was added. No impairment of growth to 8 weeks of age was seen when sodium bentonite was added to a practical-type diet.—*D. H. Laughland.* (Biological Abstracts)

PALAFOX, A. L., and **M. M. ROSENBERG.** (U. Hawaii, Honolulu.)
NIACIN CONTENT OF MOLASSES PRODUCED IN DIFFERENT LOCALITIES. *Poultry Sci. 35(5):* 1127-1128. 1956.—Samples of final molasses were obtained from different parts of the world, namely: Cuba, Louisiana, (U.S.A.), Dominican Republic, Philippine Republic, Mexico and Hawaii. The niacin content was determined microbiologically and the results showed that there was a significant difference in niacin among the molasses samples. The average analyses of 3 duplicate assays ranged from 13.06 to 21.65 μg/g. This difference was attributed, in part, by difference in varieties and variations in climatic and soil conditions among the areas where the samples were produced.—*A. L. Palafox.* (Biological Abstracts)

REED, A. and **J. G. VELU.**
LIMITED VERSUS *ad libitum* FEEDING OF WHITE LEGHORN PULLETS. *Indian J. Vet. Sci.,* 1956, *26,* No. 2, 35-44. [Dept. Animal Husb. Allahabad Agric. Inst., U.P.]—Two groups of White Leghorn hens were used in a double reversal trial over three 2-monthly alternate periods of feeding to appetite and restricted feeding, one group starting with feeding to appetite and the other with restricted feeding. The restricted birds had 3 oz. mash daily. Egg production over the whole period favoured feeding to appetite but in the second group during the first 2-month period egg production was higher on the restricted feed. In the first group efficiency of egg production was highest with feeding to appetite but in the second with restricted feeding. There was no relation between initial bodyweight and egg production during the first month or total egg production. Feeding system had no effect on egg weight.—*J. S. Thomson.* (Nutrition Abstracts and Reviews)

SKALLA, E. (Inst. Tierzucht., Landw. Hochsch., Hohenheim.) Der Einfluss der Fütterung auf die Jahreszeitliche Verteilung der Eierproduktion.
(THE EFFECT OF FEEDING ON THE SEASONAL DISTRIBU-

TION OF PRODUCTION.) *Arch. Geflügelk., 18,* 327-339, 1954.—1. The results of the above work show very distinctly with regard to both economical races (white Leghorn and partridge coloured Italians) how the main laying activity during insufficient alimentation has a tendency of falling back to the natural laying period. Specially marked has been the capacity during the winter months of the laying year of 1946/47, while merely minor deviations exist in spring and summer of above period as against the performances during 1937/38. From this it follows that with the majority of our animals the winter production of eggs varies very considerably, as same is not yet firmly established in the idioplasm, so that one may say that only on condition of a very plentiful nutrition will there be a large production of winter eggs. As soon as the feeding gets scanty the result will be a resurrection of some of a laying cycle typical of the wild hen. Up to now it has been impossible to do away with the hitherto selection, the only thing being to mark the cycle through intensive, more particularly, through a nutrition rich in albumine.

2. Comparisons of troups with regard to winter laying capacity are to no purpose unless in case of equal feeding.

3. The evaluation of the functional assessment of young hens for the production of winter eggs is more secure in case of a mercly scanty feeding than in the case of a very favorable nutrition.

4. A satisfactory weight of egg may only be expected with animals of good gene and with sufficient and particularly good nutrition. The main influence upon the egg weight makes itself felt through the hereditary assessment of the individual, whereas external influences, such as feeding, etc., are merely secondary features.

5. The comparisons between the white Leghorn and partridge coloured Italians shows that both races have an almost equally high yield of eggs in the summer months (March to July). The cause of the inferior total capacity per year of the Italians lies in the minor winter productivity.

6. The Italians are apt to react on unfavorable local influences, as f.i. insufficient feeding or very high temperatures, with more pronounced decrease of capacity as compared with Leghorn. Through this their organism does not get overstrained or damaged. And this is the reason of the widely spread opinion in practice that Italians have more stamina than Leghorn. (English summary)

STURKIE, PAUL D. (Rutgers U., New Brunswick, N.J.)

THE EFFECTS OF EXCESS ZINC ON WATER CONSUMPTION IN CHICKENS. *Poultry Sci. 35(5):* 1123-1124. 1956.—Zinc sulfate at a 1% level (2320 ppm of Zn) was added to the drinking water of White Leghorn hens for 20 days. Water consumption dropped some during the first 24 hours, then drastically after 56 hours. It remained low for about 90 hours and then increased appreciably, but never returned to normal. Egg production began to decrease on the 2d day of the experiment, and after 3 days it stopped. Four days after the consumption of Zn-free water, 3 of the 5 hens were again laying. Body weights decreased the most 10 days after the Zn treatment; although there was some increase thereafter, the weights remained subnormal.—*P. D. Sturkie.* (Biological Abstracts)

SUNDE, M. L., H. R. BIRD, J. M. SUND, and **M. J. WRIGHT.** (U. Wisconsin, Madison.)

THE USE OF LOW PROTEIN DIETS FOR TURKEYS ON RANGE. *Poultry Sci. 35(5):* 1106-1115. 1956.—Animal protein, vitamin B_{12}, and antibiotics did not improve rate of gain or efficiency of production of Broad Breasted Bronze turkeys placed on good ladino clover range and on the experimental diets at 6 weeks of age. On good range, males averaged from 22 to 23 lbs. and females from 14 to 15 lb. at 26 weeks when their mash was made up of corn, oats, minerals, vitamins and an antibiotic, and was calculated to contain 10% of protein. Males averaged 25-27 lb. and females from 15 to 16 lb. if they were fed either a 15.9% protein mash or a 20.6 protein mash.

Pasture was most effective in improving feed utilization and rate of gain when the mash was deficient in protein. Such a mash induced increased grazing and substanitally decreased feed cost per pound of turkey. Supplementary lysine added to the 10% protein diet in the presence of good range improved weight and feed utilization. It appeared that the combination of lysine and methionine resulted in slightly better performance than lysine alone.—*Auth. summ.* (Bilogical Abstracts)

SWART, L. G.
LUPINS IN LAYING RATIONS. *Farming in S. Africa 30(354):* 404-406. 1955.—In nutrition experiments at Stellenbosch University both sweet yellow lupins *(Luipinus luteus)* and bitter blue lupins *(L. angustifolius)* were fed in laying rations. The inclusion of 10% sweet lupin meal gave results which were not significantly lower than those obtained from ordinary laying rations containing fish meal. Higher levels of this protein feed had an adverse effect on the efficiency of feed consumption. The bitter or blue lupin was unsuitable as a feed because it imparted a bitter taste to the eggs. (Biological Abstracts)

SWEET, GEORGE BENTLEY. (U. Maryland, College Park.)
UNIDENTIFIED FACTORS IN CHICK, POULT, AND HEN NUTRITION. *Dissertation Absts. 16(2):* 200-201. 1956. (Bilogical Abstracts)

TAMIUE, HAKKI SHIHAB. (U. Illinois, Urbana.)
THE RESPONSE OF CHICKS TO AN UNIDENTIFIED GROWTH FACTOR IN FISH PRODUCTS. *Dissertation Absts. 15(11):* 1959. 1955. (Biological Abstracts)

THAYER, ROLLIN HAROLD. (State Coll. Washington, Pullman.)
THE ROLE OF ANTIBIOTICS IN MODIFYING THE ENERGY, VITAMIN, AND PROTEIN REQUIREMENTS OF CHICKS. *Dissertation Absts. 16(3):* 424. 1956. (Biological Abstracts)

VAN REEN, R., and P. B. PEARSON. (McCollum-Pratt Inst., Johns Hopkins Univ., Baltimore, Md.)
MANGANESE DEFICIENCY IN THE DUCK. *J. Nutr. 55:* 225-234, 1955.—1. The effects of a dietary defficiency of manganese were investigated using ducklings as the experimental subjects.

2. Forty milligrams of manganese per kilogram of diet are adequate for normal growth and prevention of perosis.

3. Alkaline phosphatase activity of liver, kidney, heart and plasma was reduced during the deficiency.

4. The decreased enzyme activity could not be correlated with the presence of an inhibitor or an altered pH optimum of alkaline phosphatase. *(Authors)*

WOOD, GLEN M. (U. Vermont Burlington.)
CONSUMPTION OF FORAGE BY CHICKENS. *Poultry Sci. 35(5):* 1083-1089. 1956.—A cafeteria or free choice technique was developed to determine forage preferences of chickens. The technique used involved serving White Rock pullets greenhouse flats of weeds and several commonly grown pasture forages. Bromegrass *(Bromis inermis)* was found to be the most palatable and birdsfoot trefoil *(Lotus corniculatus* and *tenuis)* the least palatable of the forages tested. In another experiment post mortem examinations of the crop contents of cockerels and pullets on Kentucky bluegrass *(Poa pratensis)* were made. White Rock cockerels were better foragers than the pullets. Amounts of forage consumed on a dry weight basis were 8% and 2%, respectibely.—*G. M. Wood.* (Biological Abstracts)

PATHOLOGY

GEURDEN, L. and A. DEVOS. (Rijksuniversiteit te Gent)
CHRONIC RESPIRATORY DISEASE. *Vlaams Diergeneeskundig Tijdschrift. 26:* 76-86. 1957.—After an historical survey, the author describes the symptoms, the lesions, the etiological agents, the diagnostic methods and the treatment of "Chronic Respiratory Disease".

NEWBERNE, PAUL M., and WILLIAM B. BUCK. (U. Missouri, Columbia.)
STUDIES ON DRUG TOXICITY IN CHICKS. 2. THE INFLUENCE OF VARIOUS LEVELS OF SULFAQUINOXALINE ON GROWTH AND DEVELOPMENT OF CHICKS. *Poultry Sci. 35(6):* 1259-1264. Illus. 1956.—Sulfaquinoxaline was given to chicks at various levels from day-old through 6 weeks of age. Sulfaquinoxaline at levels above 0.0125% caused minor symptoms and a slight decrease in feed consumption and weight gains. Lesions were noted in liver, kidney, bone marrow and thyroid gland. Moderate changes in the blood picture occurred in birds on high levels near the end of the experiment. No muscle or subcutaneous hemorrhages were observed.—*P. M. Newberne.* (Biological Abstracts)

OLSEN, M. W. (U. S. Dept. Agric., Beltsville, Md.)
FOWL POX VACCINE ASSOCIATED WITH PARTHENOGENESIS IN CHICKEN AND TURKEY EGGS. *Science 124(3231):* 1078-1079. 1956. (Biological Abstracts)

OTT, W. H., S. KUNA, C. C. PORTER, A. C. CUCKLER (Merck Inst. Therap. Res., Rahway, N. J.), and **D. E. FOGG.** (Merck Sharp and Dohme Res. Labs., Rahway, N. J.)
BIOLOGICAL STUDIES ON NICARBAZIN, A NEW ANTICOCCIDIAL AGENT. *Poultry Sci. 35(6):* 1355-1367. 1956.—Nicarbazin is a unique chemical complex of 2 compounds, 4,4′-dinitrocarbanilide which has relatively low anticoccidial activity, and 2-hydroxy-4,6-dimethylpyrimidine which has none. The chemical complex has at least 10 times the anticoccidial potency of the active component. Laboratory, floorpen and field trials have shown that nicarbazin is a highly effective anticoccidial agent recommended for continuous use at a level of 0.0125% in the feed of growing chickens to prevent coccidiosis outbreaks. Nicarbazin medication effectively reduced severity of the pathological lesions and suppressed formation of oocysts, and a high degree of immunity to re-infection with coccidia was acquired by chickens exposed to coccidial infection. Tolerance studies showed that nicarbazin was satisfactorily tolerated by chickens, turkeys, and several species of laboratory and farm animals. Continuous feeding of the approved use-concentrations (0.01 to 0.02%) of nicarbazin permitted optimal growth and feed utilization in young chickens and did not interfere with sexual maturity, egg production or fertility in adult chickens. However, 2 temporary effects were noted when nicarbazin was fed to laying hens. In New Hampshire hens the normal brown pigmentation of the shell was greatly decreased 3 days after beginning nicarbazin medication, but returned to normal as quickly following withdrawal of the drug. Hatchability was also temporarily reduced when nicarbazin was fed but returned to normal 2-3 weeks after discontinuance of the medicated feed. Neither of the components of nicarbazin accumulated in the tissues of chickens. There was no evidence from studies with radioactive nicarbazin that the dinitrocarbanilide component was metabolized to compounds which accumulated in the tissues of chickens. The safety of nicarbazin for poultry feeds was demonstrated by feeding dogs for more than 3 months on large quantities of meat from chickens grown on nicarbazin-medicated rations.—*W. H. Ott.* (Biological Abstracts)

PRITCHARD, W. R., O. S. DAVIS, D. B. TAYLOR, and L. P. DOYLE. (Purdue U., Lafayette, Indiana.)
APLASTIC ANEMIA IN CHICKEN FED TRICHLOROETHYLENE-EXTRACTED SOYBEAN OIL MEAL (TCESOM) AND

FAILURE OF THIS DIETARY MEAL TO SUPPRESS THE DEVELOPMENT OF EXPERIMENTAL LYMPHOMATOSIS. *Amer. Jour. Vet. Res. 17(65):* 771-777. 1956.—Young chickens fed semisynthetic diets containing 72.9% trichloroethylene-extracted soybean oil meal (TCESOM), 72.9% hexane-extracted soybean oil meal (HEXSOM) and a natural corn-soybean ration were inoculated with suspensions of avian lymphomatosis tumors. There was no difference in the development of tumors in the chickens on the different diets. The chickens fed TCESOM developed aplastic anemia with clinical signs, hematological and pathological changes indistinguishable from those in field cases of aplastic anemia or so called hemorrhagic syndrome. No blood changes occurred in those fed HEXSOM or the natural diets.—Authors. (Biological Abstracts)

ROSS, RICHARD T., D. FRANK HOLTMAN, and **ROBERT F. GILFILLAN.**
THE NEED FOR ANTIBIOTIC FREE DIETS IN THE EXPERIMENTAL INFECTION OF ANIMALS. *Jour. Tennessee Acad. Sci. 31(4):* 253-255. 1956.—As little as 8 g of Aureomycin and 2 g of penicillin per ton of chick starter mash were found to interfere markedly with the laboratory infection of chicks with *S. pullorum* CDC 3522/51. It is suggested that antibiotic feeds should be withheld from the diets of chicks during experimental investigations concerned with infectious disease because of their interference with the typical symptomatology. Conversely, it is suggested that antibiotics in feeds might be highly desirable for prevention of spontaneous infections whenever chicks are to be subjected to nutritional or physiologic study.—*D. F. Holtman.* (Biological Abstracts)

TUBBS, CHARLES R.
PAPILLOMAS IN TURKEYS. *Jour. Amer. Vet. Med. Assoc. 128(5):* 265. 1956.—Papillomas, 0.25-1.25 inches in size, noted in 9 turkeys, disappeared 3 weeks after 0.25 cc of wart vaccine of bovine tissue origin was given subcutaneously to one, and 0.5 cc of chicken embryo origin was given intradermally to the others.—*J. F. Ryff.* (Biological Abstracts)

POULTRY PRODUCTS AND MARKETING

ADAMS, JOHN L. (U. Wisconsin, Madison.)
THE EFFECT OF DIETHYLSTIBESTROL ON LARGE TYPE VERSUS SMALL TYPE TURKEY BROILERS. *Poultry Sci. 35(6):* 1251-1254. 1956.—Two varieties of turkeys, Jerome Broadwhites and Beltsville Whites, a larger and a small type turkey respectively, were compared as to response to treatment with a 15 mg pellet of diethylstilbestrol. Starting age was adjusted so that the 2 varieties would reach an average weight (both sexes) of 8 lb. Treatment was for 20 days prior to slaughtering. Gain during the treatment period was increased .18 ± .09 lb. for females and .28 ± .07 for males. This gain was reflected in an increased cash return due to treatment of 6 cents per bird for females and 9 cents for males. Both varieties showed increased gain due to hormone treatment. Finish was improved significantly in both sexes and in both varieties. Treated Broad-white turkey broilers were fatter than untreated Beltsville broilers showing that the varietal difference in fat grade can be more than overcome by hormone treatment.—*J. L. Adams.* (Biological Abstracts)

DAVIDSON, J. A., W. N. FISCHER, H. C. ZINDEL, and **C. M. McCRARY.**
MICHIGAN BROILER TEST NO. 2. Fall 1955. *Michigan State Univ. Agric. Expt. Sta. Quart. Bull. 38(4):* 486-491. 1956.—Eighteen lots of 104 chicks from 11 breeders and hatcheries were grown to 10 weeks of age. A sample of 10 birds of each sex was slaughtered and carcass quality and the yields were determined. The mean live weight for all birds was 3.4 and 2.73 lb. for males and females, respectively. The mean carcass yield was 70.9% of the live weight for the females and 72.49% for the males. It required 3.07 lb. of feed to produce a pound

of live chicken, with a range among the varieties and crosses of 2.68 to 3.65 lb. of feed. Mortality ranged from 0 to 5.77% in the lots with a mean of 2.71% of all birds.—*J. A. Davidson.* (Biological Abstracts)

DESKINS, BARBARA, and **A. R. WINTER.** (Ohio State U., Columbus.)
COOKED, EDIBLE MEAT IN PARTS OF POULTRY. II. GEESE. *Jour. Amer. Dietetic Assoc. 32(3):* 211-213. 1956.—Dressing loss (blood and feathers) of geese (7-13 lb.) averaged 13.3% evisceration, 28.5% of live weight; the edible portion of meat, based on this raw carcass weight, exclusive of neck and giblets was 39-42% depending on age of the young bird. Fat content increased with age.—*M. C. Moore.* (Biological Abstracts)

FEENEY, ROBERT E. (U. Nebraska, Lincoln), **JOHN M. WEAVER, JOAN R. JONES,** and **MARVIN B. RHODES.**
STUDIES OF THE KINETICS AND MECHANISMS OF YOLK DETERIORATION IN SHELL EGGS. *Poultry Sci. 35(5):* 1061-1066. 1956. —Rates of deterioration of egg yolk when shell eggs were stored at different temperatures were studied and the results were used to compare and to calculate reaction rates. An overall activation energy of approximately 18,000 calories was calculated for decreases in yolk index when eggs were stored at temperatures varying from 21.5° to 46°C. This gave an apparent Q_{10} of about 3. The close similarities between deteriorations of thick egg white and yolk membrane were discussed. It was suggested that these 2 deteriorations may have the same basic causative mechanisms.—*R. E. Feeney.* (Biological Abstracts)

FLORIAN, M. L. E., and **P. C. TRUSSELL.** (Brit. Columbia Res. Counc., Vancouver, Canada.)
BACTERIAL SPOILAGE OF SHELL EGGS. IV IDENTIFICATION OF SPOILAGE ORGANISMS *Food Technol. 11(1):* 56-60. 1957. —From 81 infected eggs obtained from 4 sources, 197 organisms were isolated in pure culture. All organisms were Gram-negative, rod-shaped bacteria mainly of intestinal origin. The principal spoilage species were *Pseudomonas fluorescens* and *Alcaligenes bookeri* strain. Distribution of bacterial species in infested eggs varied between different egg sources. Of the 19 identified species and 11 unclassifiable isolates found in eggs, only 10 identified species in pure culture were capable of penetrating the inner membrane of the egg and infecting the egg contents. These were: *Pseudomonas fluorescens, P. putrefaciens, Alcaligenes bookeri* strain (a), *A. metalcaligenes, A. faecalis, Proteus vulgaris* strains (a) and (b), *P. melanovogenes, Flavobacterium invisible* and *Paracolobactrum inter-medium* strain (a).—Authors. (Biological Abstracts)

HENDERSON, E. W., L. E. DAWSON, H. C. ZINDEL, and **E. H. FARMER.** (Michigan State U., East Lansing.)
"MICHIGAN MINIATURE" BROILER PRODUCTION. *Mich. State Univ. Agric. Expt. Sta. Quart. Bull. 33(4):* 547-554. 1956.— Inheritance of meat type and growth rate were prime essentials for production of the most satisfactory pound sized package. Breeding was more important than breed. Feed conversion efficiency varied from 2.3 lbs. to 2.8 lbs./lot from the 5th-8th week of marketing age. About 20% of the chicks qualified for the pound sized package at 5 weeks. The balance required 6-7 weeks to reach the ideal weight of 1.5 lb. and a meat type score of "3" (minimum standard). Six and seven-week-old chicks withstood mechanical picking. Dressing percent (live to packaged weight varied from 67-70%. About 7% of the loss was from a 16-hour predressing starvation period.—Authors. (Biological Abstacts)

JOHNSON, A. S. (Canada Dept. Agric., Ottawa.)
GENETIC AND SEASONAL VARIATION IN INCIDENCE OF BLOOD AND MEAT SPOTS IN CHICKEN EGGS. *Canadian Jour. Agric. Sci. 36(5): 390-393.* 1956.—Blood and meat spot incidence in 23,000 eggs from White Leghorns and Barred Rocks was determined monthly from November to August. The percentages of eggs with these inclusions increased gradually until late spring. Heritability estimates

for blood spot incidence averaged .211 in the White Leghorns and .066 in the Barred Rocks. The mean estimate of heritability of the meat spots in Barred Rock eggs was .250.—*A. S. Johnson.* (Biological Abstracts)

JOHNSTON, FRANCES A. (Cornell U., Ithaca, N. Y.)
IRON CONTENT OF EGGS. *Jour. Amer. Dietetic Assoc. 32(7):* 644-646. 1956.—Mean Fe content of whole eggs from 2 areas of New York State was 2.09 and 2.06 mg/100 g. The average value published in the Agricultural Handbook No. 8 is 2.7 mg. The white values obtained did not differ materially from the value in the above publication.—*M. C. Moore.* (Biological Abstracts)

KLIESCH, J. and **G. BORMANN.** (Inst. Tierzucht., Tech. Univ., Berlin.)
Untersuchungen über die Wirtschaftlichkeit der Hähnchenhaltung bei Anwendung der hormonalen Kastration.
EXPERIMENTS CONCERNING THE ECONOMICS OF REARING COCKERELS WHEN USING HORMONAL CASTRATION. *Arch. Geflügelk., 18:* 469-486, 1954.—The intention of this study was to examine if it is possible to get a better and more appropriate utilization of the 15-18 millions of cockerels, especially of the lighter races, each year in the Western German Federation by using hormonal castration. The experiment was carried out in 3 groups, each with 90 cockerels. The age of these animals in the different groups was 8, 10 and 12 weeks. Each of these groups was subdivided into 3 sub-groups, each with 30 cockerels which were treated with 3 different hormonal preparations: Kapaunetten (Bayer), Depot Sexocretin Nr. 346 and Sexocretin Nr. 5108 (Merck). Considering the results the hormonal castration is of commerical importance. (English Summary)

OREL, VITEZSLAV, and **FRANTISEK MUSIL.** (Res. Inst. Milk and Eggs, Prague.)
THE INFLUENCE OF THE POSITION OF THE EGGS UPON THEIR INTERIOR QUALITY. *Poultry Sci. 35(6):* 1381-1384. 1956.—The influence of egg position in cases upon their interior quality was determined. The eggs were storaged 10 days at the temperature of 77° F. In eggs placed small end up the average albumen index value was 6-7% and in horizontal position by 14.9% lower than in eggs placed small end down, the difference being highly significant ($p < 0.01$). In eggs placed small end up the yolks were more visible by candling and the decline in candling grade value reached 6.9%.—*V. Orel.* (Biological Abstracts)

PIPPEN, E. L., and **E. J. EYRING.** (Western Utilization Res. Branch, Agric. Res. Serv., U. S. Dept. Agric., Albany 6, Calif.)
CHARACTERIZATION OF VOLATILE NITROGEN AND VOLATILE SURFUR FRACTIONS OF COOKED CHICKEN AND THEIR RELATION TO FLAVOR. *Food Technol. 11(1):* 53-56. 1957.—Methods were developed for determining total sulfur, mercaptan sulfur, and sulfide sulfur in volatile components of cooked chicken. Analytical results showed that volatile sulfur was evolved solely as sulfide which may subsequently undergo oxidative change. Nitrogen, in the form of ammonia, was present among volatile substances in relatively high concentration. The significance of these findings to flavor is discussed.—*E. L. Pippen.* (Biological Abstracts)

SAJNER, J. (Pharmacological Institute, University Brno, Czechoslovakia
Pronikani oleje vajecnou skorapkou.
PASSAGE OF OIL THROUGH THE EGGSHELL. *Polnohospodarstvo, 1957, 4:* 60-67.—Penetration tests with Sudan III and Scharlach R (1 per cent solution) dyed oil. The easily penetrating oil concentrated itself in the eggshell membrane and stained it very intensively. The egg shell membrane prevented a further passage of oil into the interior of the egg and no colouring of albumen was observed. The egg shell membrane also prevented a passage of oil from the interior to the outer surface of the egg sheli. Oil at a temperature of 100°C passes through

the egg shell 2-3 times more quickly than oil of normal temperature. Eggs, preserved in lime water, do not permit the oil to pass through the shell at all. Cross-sections of eggshells dyed with Sudan III or Scharlach R solution in no case showed under the microscope any canal-like pores. (Orel)

SCOTT, M. L. (Cornell U., Ithaca, N. Y.)
COMPOSITION OF TURKEY MEAT. *Jour. Amer. Dietetic Assoc. 32(10):* 941-944. 1956.—Data on the dressing % and nutrient composition of the edible portions of raw and roasted turkeys of various varieties and ages are presented. Compared with other meats, the calorie content of breast and leg meat is comparable to veal and round steak; higher than young chicken roasters; but lower than other meats. It also exceeds three-fold the riboflavin and niacin content of most other cooked meats. —*M. C. Moore.* (Biological Abstracts)

SUZUKI, S., K. TANAKA, and **G. ABE,** 1956. (Tokyo Agric. Coll.)
STUDIES ON WING-CLIPPING OF CHICKS. II. THE EFFECT OF WING-CLIPPING ON THE CHEMICAL COMPOSITION OF THE MEAT. *Jap. J. zootech. Sci., 27:* 9-11. [Japanese with English summary.] —Ninety-six S.C. White Leghorn cockerels were divided into 8 groups. In the control group the wings were not clipped; in the 7 experimental groups the wings had been clipped at different times (32-68 hrs.) after hatching. On the 71st day 2 birds from each group were killed and determinations were made of the water, crude protein and crude fat content of the meat.

There was no significant difference between clipped and unclipped birds in av. body weight increase, although the 2 groups in which clipping was performed 32 and 38 hrs. after hatching showed a slightly greater weight increase than did the controls, and the percentage of meat in the carcass was higher. Birds whose wings were clipped at 32 and 38 hrs. produced 30% and 23% more crude protein, and 89% and 36% more crude fat than the controls. — Abstract of English summary. (Animal Breeding Abstracts)

WALDEN, C. C., I. V. F. ALLEN, and **P. C. TRUSSELL.** (B. C. Res. Council, Vancouver, Canada.)
THE ROLE OF THE EGG SHELL AND SHELL MEMBRANES IN RESTRAINING THE ENTRY OF MICRO-ORGANISMS. *Poultry Sci. 35(6):* 1190-1196. 1956.—Shell pore count observations showed no difference between infertile eggs from New Hampshire, Leghorn and crossbreed hens. Porosity values measured on dry egg shells were highest for shells dried under vacuum below protein denaturation temperatures. Removal of the inner shell membrane, both membranes and the cuticle from egg shells did not appreciably increase dry shell porosities. No significant difference was noted in porosity values obtained with dry shells from infected and uninfected eggs. Wet and dry shell porosities did not correspond; therefore, dry shell values are not a reliable index of the egg's physical defences against microorganisms. Tracer experiments indicated mechanical restraint of P_{32} labelled Pseudomonas fluorescens Migula by shell membranes for periods up to 15-20 hours.—*C. C. Walden.* (Biological Abstracts)

WILSON, MAXINE. (Purdue U., Lafayette, Indiana.)
DETERMINING WORK LOADS BY RANDOM RATIO-DELAY SAMPLING. *Jour. Amer. Dietetic Assoc. 32(8):* 716-718. 1956.—Drip loss from cut-up frozen chicken, when thawed before cooking, may result in significant lessening of thiamine, riboflavin and niacin. This did not seem true for frozen whole turkeys. Cooking without thawing was suggested to conserve the nutrients.—*M. C. Moore.* (Biological Abstracts)

YAO, KA TENG. (U. Illinois, Urbana.)
FACTORS AFFECTING THE RATE OF CHICKEN MEAT DEHYDRATION UNDER VACUUM. *Dissertation Absts. 16(5):* 1941. 1956. (Biological Abstracts)

ZAGAEVSKII, I. S. Nekotorye factory, vliiaiushchie na obsemenennost tushek vodoplavaiuschei ptitsy.

FACTORS CAUSING THE CONTAMINATION OF WATER FOWL IN THE PROCESS OF DRESSING AND THE MEANS OF ITS PREVENTION. *Voprosy Pitaniia 14(4): 31-34.* 1955, Referat. Zhur., Biol., No. 21038. (Translation).—Food was withheld from the birds prior to killing in one series of experiments; in another series the evisceration was done at different time intervals after the birds were killed. The results were tabulated and interpreted. (Biological Abstracts)

ZNOJILOVA, V. (Central Control Agricultural Institute, Brno, Czechoslovakia) Vlastnosti krutich vajec jako potraviny.

PROPERTIES OF TURKEY EGGS AS FOOD. *Sbornik CAZV, zivocisna vyroba, 30:* 243-252.—On the ground of ascertained properties (chemical composition and technological quality) turkey eggs are considered to be suitable for consumption and technological use. The quality of albumen and keeping quality of turkey eggs were found to be higher than that of hen eggs. The rate of evaporation was the same in both kinds of eggs. The thickness of the shell was in turkey eggs on an average 0.42 and that of hen's egg 0.37 mm whereas the egg shell of turkey eggs was found to be more fragile. The chemical composition of the albumen and yolk of turkey eggs was found nearly the same as that of the hen egg. The yolk of turkey eggs, contained a little more fat and less protein. Turkey eggs also satisfactorily replaced hen eggs in the preparation of pastry. (Orel)

MANAGEMENT

HALL, M. D. 1956.

POULTRY HOUSE LIGHTING. *J. Agric. Vict., 54:* 361, 363.—In tests carried out by the State Electricity Commission of Victoria on commercial poultry farms, pullets in pens which were artificially lighted from 3:30 a.m. to 7:30 a.m. for a period of 4½ mths. gave an 18.6%, and 2-yr-olds a 16.2% higher egg production than similar birds in unlighted pens. A further lighting experiment was conducted for a period of 2½ mths. with pens each of 275 three- and four-yr-old hens. The av. number of eggs per 100 hens per day was 17.3 when birds received no lighting. 40.0 with lighting from 5 p.m. to 7 p.m., 44.1 with lighting from 5 a.m. to 7 a.m. and 58.9 with lighting morning and evening. (Animal Breeding Abstracts)

IVANOV, V. G. Vliyanie sroka khraneniya yaits na sootnoshenie polov v potomstve kur.

EFFECT OF EGG STORAGE TIME ON THE SEX RATIO OF HEN PROGENY. *Doklady Akad. Nauk SSSR 100(5):* 1021-1023. 1955; Referat. Zhur., Biol., 1956. No. 14354. (Translation.)—Eggs of White Leghorns were placed in the incubator less than 1 hour after laying and also after storage for 6, 11, and 19 days. The first three series contained 100 eggs each, and the fourth 154. In the first series, 98.9% of the fertile eggs developed fully; the day-old chicks had the best bonitation data; the total incubation time was 20 days; females were predominant among the chicks (63.3%). Fewer chicks were raised in the other series (75.2-94.6% of the fertile eggs), and incubation was longer, the incubation time increasing with greater storage time. The sex ratio in these series was shifted in the direction of male predominance (53-59%). In production conditions, 55.5% males were raised from 56033 eggs stored for 3-5 days. (Biological Abstracts)

KOSIN, I .L. (State Coll. Washington, Pullman.)

STUDIES ON PRE-INCUBATION WARMING OF CHICKEN AND TURKEY EGGS. *Poultry Sci. 35(6):* 1384-1392. 1956.—Studies were conducted in 1953, 1954, and 1955 on the effect of pre-incubation warming of chicken and turkey eggs on their subsequent hatchaibility. The procedure, in the main, consisted of subjecting the eggs either (a) to daily warming for the duration of the pre-setting storage period

(1-14 days), interspersed with storage at temperature range simulating day and night fluctuations outdoors; or (b) to a single extended warming period of 2 or 5 hours followed by a storage at 53°F. All warming was carried out in a forced-draft incubator maintained at 99¼°F and 50% relative humidity. Aside from several treatments which were either ineffective or had actually depressed hatchability, the warming procedure resulted in improved hatchability of fertile eggs. The improvement was most striking in the case of turkey eggs which were stored beyond seven days prior to setting. The most consistent and marked improvement was in the turkey eggs subjected to a single five-hour warming period. In turkey eggs, along with improved hatchability, there was a shortening of the mean length of incubation period by 2-7 hours. Again, this effect was more pronounced in the older eggs. The early development of turkey embryos, as judged by the somite count, was also stimulated by the warming procedure.—*I. L. Kosin.* (Biological Abstracts)

ROMIJN, C., and W. LOKHORST. De mogelijkheid van controle op de naleving van de voorschriften betreffende de ontsmetting van broedeieren.

THE POSSIBILITY OF A CONTROL ON THE OBSERVANCE OF THE REGULATIONS CONCERNING THE DISINFECTION OF INCUBATED EGGS. *Tijdschr. Diergeneesk. 80(21):* 1135-1143. 1955. —Authors describe 2 methods for controlling the fumigation of incubated eggs: a colorimetric one with Schiff's reagent and a quick test.—*F. de Moulin.* (Biological Abstracts)

SMITH, ROBERT M.

MANAGEMENT INVESTIGATIONS OF THE SMALL LAYING FLOCK. *Arkansas Agric. Expt. Sta. Bull. 579:* 1-12. 1956.—Influence of free access to range versus partial confinement on egg production, feed requirement, viability, and weight gain of the small flock is reported for 4 production trials. Also reported, on 3 trials, is the influence of roosts versus no roosts. Any advantage or disadvantage of range compared to confinement management did not seem to justify the recommendation of one system over the other. Partial confinement of the small farm flock resulted in a slight reduction in egg production, a corresponding higher feed requirement per dozen eggs, and an increase in weight gain during the first egg production year. The management of the small farm flock without roosts was as efficient as the use of roosts from the standpoints of egg production, feed requirement, gain in body weight, and viability during the first egg production year.—*M. Ford.* (Biological Abstracts)

GENERAL

KOSIN, I. L., and ANNE WHEELER. (State Coll. Washington, Pullman.)

METHODS FOR ESTIMATING SPERMATOZOAL NUMBERS IN TURKEY SEMEN. *Northwest Sci. 30(2):* 41-47. 1956.—Average concentration is of the order of 10 x 10^6/cu mm. Dilutions of 1:500 or 1:1000 should be used for haemocytometer method, but optical density measurement is preferred method.—*R. W. Dexter.* (Biological Abstracts)

PUDELKIEWICZ, W., L. M. POTTER, L. D. MATTERSON, and E. P. SINGSEN. (U. Connecticut, Storrs.)

A SEMIQUANTITATIVE METHOD FOR THE DETERMINATION OF DPPD IN CHICKEN FAT AND EGGS. *Poultry Sci. 35(4):* 959-960. 1956.—A method for the determination of N,N'-diphenyl-p-phenylenediamine (DPPD) in chicken fat and eggs was developed. The method is based upon freeze-drying a sample of tissue, dissolving the extracted lipids in acetone, precipitating them out at low temperatures, filtering, molecularly distilling an aliquot, and determining the concentration colorimetrically. Recoveries of 90% of the DPPD added to 10-15 g of chicken fat were obtained. DPPD was detected in the eggs,

fat, and liver of hens. An intimate association with the lipid portion of tissue appears to exist.—*L. D. Matterson.* (Biological Abstracts)

ROMIJN, C., and **A. H. J. VISSCHEDIJK.** (Lab. Vet. Physiol., State Univ., Utrecht.) Barometerdruck und Bruttechnik.

BAROMETRIC PRESSURE AND INCUBATOR TECHNIC. *Arch. Geflügelk., 19:* 191-200, 1955.—The influence of barometric pressure on the oxygen supply of the embryo has been discussed and suggestions to prevent foetal death by oxygen need at high altitude have been put forward.

The fluctuations of the mean temperature in incubators, supplied with aether-thermostats could be recorded, together with the alterations in barometric pressure. A linear relationship between the mean temperature in that kind of incubators and the barometric pressure could be established. Variations in the barometric pressure of half an inch corresponded with fluctuations of mean temperature of about 0.7° F. After replacing the above mentioned thermostats for "Sunvic" thermostats in combination with "Sunvic" relais, the air pressure had no longer any influence on the mean level of the temperature in the incubator. Moreover, the variations in temperature, caused by the activity of the thermostats themselves, were considerably decreased. The independence of the incubator from its environment could be increased markedly by using thermostats of the "Sunvic" type. (English summary)

SIEGEL, P. B., and **A. M. GUHL.** (Kansas State Coll., Manhattan.)

THE MEASUREMENT OF SOME DIURNAL RHYTHMS IN THE ACTIVITY OF WHITE LEGHORN COCKERELS. *Poultry Sci. 35(6):* 1340-1345. 1956.—The object of the experiment was to test automatic equipment for measurement of certain types of activity in a pen of cockerels and obtain data that may be associated with daily variations of these activities. It was concluded that rates of certain types of activities within the pen could be efficiently determined through use of photoelectric systems.—*P. B. Siegel.* (Biological Abstracts)

WILLIAMS, CLETIS (Oklahoma A. and M. Coll., Stillwater), and **W .H. McGIBBON.** (U. Wisconsin, Madison.)

AN ANALYSIS OF THE PECK-ORDER OF THE FEMALE DOMESTIC FOWL, GALLUS DOMESTICUS. *Poultry Sci. 35(5):* 969-976. 1956.—A straight-line or linear peck-order was observed among the females of this study. The order of dominance among the breeds of females was: Barrel Plymouth Rocks, Silverbars, New Hampshires, and White Leghorns. Hens high in the peck-order did not peck or threaten all subordinate hens at the same magnitude while hens low in the peck-order issued pecks and threats at approximately the same frequency. Hens high in the peck-order issued more pecks and threats than did hens low in the peck-order. Hens that received a large number of pecks did not issue more pecks in return. Pecks were issued by hens over a period of time at a more or less constant rate. Pecks were issued equally throughout the dav. Barometric pressure had no effect on the number of pecks issued. Feeding grain within a limited area had no effect on the number of pecks issued. No changes within the peck-order were observed upon the implantation of gonadal hormones.—*Cletis Williams.* (Biological Abstracts)

WOELK., M. (Inst. Tierzucht, Justus Liebig Hochsch., Giessen.) Die Anwendung der Grosszahl-Forschung und Häufigkeitsanalyse in einem Geflügelversuch.

APPLICATION OF STATISTICAL AND FREQUENCY ANALYSIS IN A POULTRY EXPERIMENT. *Arch. Geflügelk., 18:* 264-271, 1954.—The use of the big number exploration and of the frequency analysis, which constitute a graphical method developed in industrial practice, is being described. Author comes to the conclusion that this method may be useful but is not in a position to supersede customary procedures. (English Summary)

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There is also increasing evidence that larger size granite grit fed earlier gives increased feed efficiency, develops larger and stronger gizzard muscles, with less grit consumed.

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Methionine is one of the essential sulfur amino acids necessary for proper amino acid balance and is the one most likely to be deficient in poultry starting rations. Experiments and field results have proved beyond doubt that supplemental methionine will increase feed efficiency and improve feathering and market finish of birds.

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Each month U.S.I. publishes a full page FEED NEWS in the leading publications reaching nutritional and feed formulation specialists. Informative items of interest to all who use feeds and feed supplements are included. Follow this series in U.S. feed publications for new developments in the poultry feeding industry, or send us your name, address and title on your company letterhead to be placed on our mailing list.

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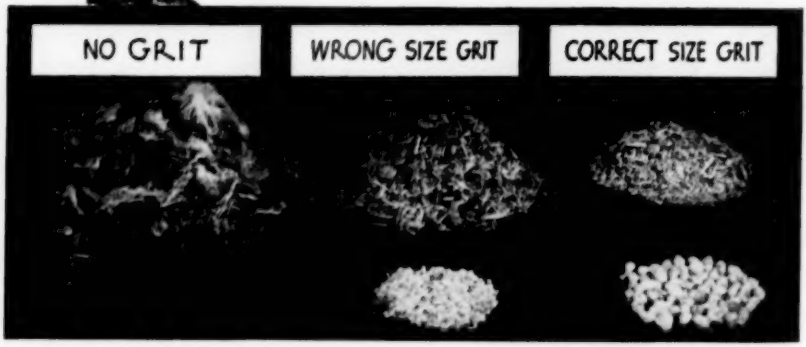

This picture tells you why Stonemo Granite Grit is needed

Look at this picture carefully. At the end of 22 weeks these pullets fed an all-mash diet were killed and the gizzard's contents washed and later dried.

Note the fiber, feather, litter content of the gizzard from a single bird (see section of picture marked "no grit".) Note how much less cloggy bulk there is even when fine size grit (the wrong size) is used (see section of picture marked "wrong size grit".)

Now look at the section of the picture marked "correct size grit." See how fine the granite grit grinds the feathers, litter, and fiber. This gives birds more room in their gizzards for processing feed for extra eggs.

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by

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President of the B.N.A.

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